The Quality of Parent-Child Relationship and Health in Later Life

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Declaration and Inclusion of Material from a Prior Thesis

This thesis, presented for the degree of Doctor of Philosophy at the University of Warwick, contains no material, which has been accepted for any other degree in any university. This thesis contains no material written, or previously published, by any other person, except where due reference is given in the text.

Signature:

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Research Training and Presentations

2007	Postgraduate Certificate in Post-Compulsory Education (Higher Education), University of Warwick
2006	Robertson, W., Arsene, C., & Stewart-Brown, S. Is the quality of parent/child relationships predictive of teenage pregnancy? A systematic review of longitudinal studies. Faculty of Public Health Conference, 2006.
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Abbreviations

AAPI: Adult-Adolescent Parenting Inventory

ACTH: Adrenocorticotrophic Hormone

ALSPAC: The Avon Longitudinal Study of Parents and Children

B: Beta coefficient

BF: Perpetrator-Biological Father

BG: Berkeley Guidance Study

BGS: Berkeley Growth Study

BMI: Body Mass Index

BSI: Brief Symptom Inventory

CAs: Catecholamines

CHD: Coronary Heart Disease

CHDS: Christchurch Health and Development Study

CHP group: Chronic Health Problems group

CI: Confidence Interval

CIDI: Composite International Diagnostic Interview

CNS: Central Nervous System

CPA: Child Physical Abuse

CRF: Corticotrophin Releasing Factor

CRYF: Cardiovascular Risk in Young Finns study

CSA: Child Sexual Abuse

CTS: Conflict Tactics Scale

DAS: New York City Division of AIDS services

DIS-III-R: Diagnostic Interview Schedule (version III-R)

G1: Generation one

G2: Generation two

GI/GYN: Gastrointestinal and Gynaecological

GP: General Practitioner

HPA: Hypothalamic-Pituitary-Adrenal

HMO: Health Maintenance Organization

HOME Inventory: Home Observation for Measurement of the Environment Inventory

HOME MER: Home Observation for Measurement of the Environment Inventory- Maternal Emotional Responsiveness scale

IGS: Intergenerational Studies

IRR: Incidence Rate Ratio

IRS: Insulin Resistance Syndrome

IV: Interparental Violence

JOBS: Job Opportunities and Basic Skills Training Programme

LQ: Lower Quartile

MDD: Major Depressive Disorder

MFIP: Minnesota Family Investment Program

MMPI: Minnesota Multiphasic Personality Inventory

MP: Multiple Perpetrators

N: Number

NCDS: National Child Development Study

NCHS: National Center for Health Statistics

NDI: National Death Index

NIH: National Institute of Health

NLSCY: Canadian Census Linked National Longitudinal Survey of Children and Youths

NE: Norepinephrine

NHP group: No Health Problems group

NICHD: National Institutes of Child Health and Human Development

NK: Natural Killer cells

OGS: Oakland Growth Study

OR: Odds Ratio

P value: Probability Value

PA: Parental Attachment

PBI: Parental Bonding Instrument

PBI mcare: Parental Bonding Instrument-maternal care scale

PBI pcare: Parental Bonding Instrument-paternal care scale

PMK: Person Most Knowledgeable about the child

PSI: Parenting Stress Inventory

PVN: Parvo-Ventral Nucleus

PWH: Patients with HIV/AIDS

RR: Relative Risk

5-HT: Serotonin (5-hydroxytryptamine)

SAM: Sympathetic-Adrenal Medullary

SBP: Systolic Blood Pressure

S.E.: Standard Error

SECC: Study of Early Child Care

SEI: Self Esteem Inventory

Serum HDL-C: High-Density Lipoprotein Cholesterol

Serum TG: Triglycerides

SES: Socioeconomic status

SLECC: Stressful Life Events and Conditions Checklist

SNS: Sympathetic Nervous System

SP: Single Perpetrator

SRCAP: Self-Report of Child Physical Abuse

SRDI: Self-Report Delinquency Inventory

SSF: Subscapular Skinfold Thickness

UNICEF: United Nations Children's Fund

UK: United Kingdom

UQ: Upper Quartile

US: United States

Vs.: Versus

WBC: White Blood Cells

X^2: Chi-square

YSR: Youth Self Report

%: Percentage

Abstract

Background: Epidemiological studies have shown that social and emotional support can protect against premature mortality and prevent illness. The long-term consequences of poor parent-child relationships on adult mental health have been a major focus of research. Much less attention has been directed towards the effects on physical health outcomes.

Objective: Based on the life course model, this thesis assessed the extent to which child-parent relationships influence physical health in later life.

Methods: The dissertation was based on a systematic review of longitudinal studies linking parent-child relationships and physical health in adulthood, and on secondary data-analyses of the Christchurch Health and Development Study. The role played by different confounders and mediators was discussed. The analyses were based on multivariate regression methods.

Results: Most of the systematic review studies showed a positive association between poor parenting and health in later life. Supportive of the association were studies on general health relying on self-reports. Non-supportive were studies looking at mortality and rare diseases and relying on official records. Some of the studies presented their findings in relation to gender, girls being more likely to somatise in adolescence or in adulthood.
An association was found for the Christchurch Health and Development Study between the quality of parent-child relationship and hospital admission or the number of doctor visits. These effects were more pronounced in females. Overall, adjusting for different confounders and mediators added some information, but did not replace the effect of the exposure variables on the outcomes.

Conclusion: More research is required in understanding how the early behavioural, environmental and social factors work together in the development of long term health outcomes. Given the growing evidence of the long term effects of poor parent-child relationships, greater efforts are clearly needed in developing effective strategies for prevention and intervention.

Chapter 1

Introduction

Experiences in childhood establish a physical, psychological and social foundation on which future development and adult health and well-being will be based: 'What happens during the first months and years of life matters a lot, not because this period of development provides an indelible blueprint for adult well-being, but because it sets either a sturdy or fragile stage for what follows' ('Neurons to Neighbourhoods', The National Academies, 2000). Research has shown that family factors including socioeconomic status, family structure, parenting style, parent involvement, family cohesion, and family stress influence children's academic achievement and social and emotional development (Baumrind, 1991; Forehand, Biggar, & Kotchick, 1998; Georgiou, 1995). However, much less attention has been directed to the effects on later life physical health (Feldman, Fisher, & Seitle, 1997; Gottman, Katz, & Hooven 1996; Newcomb, 1997; Pulkkinen, 1990; Pulkkinen, 1992; Wickrama, Lorenz, & Conger, 1997; Orth Gomer, Rosengren, & Wihelmsen, 1993; Askildsen, Watten, & Faleide, 1993).

Using a life course approach, this thesis aims to discuss the association between the quality of parent-child relationship and health in later life. A life course approach to adult health is not a new concept – the idea that experiences in earlier life shape adult health, was the prevailing model of public health in the first half of the twentieth century. Since the 1980s, there has been a revival of interest in life course epidemiology in response to

growing empirical evidence from the maturing birth cohort studies and the revitalisation of historical cohorts.

This dissertation is based on a systematic review of longitudinal studies linking parenting with health and disease in adulthood, and secondary data analyses on a New Zealand cohort, Christchurch Health and Development Study. The study aims to increase our understanding of the relationship between adverse childhood experiences and health in later life.

Failure to influence children's life in a positive way may have different negative outcomes on child development and may result in excessive morbidity later on.

Gaining a greater appreciation of how risk factors are working together will be valuable in developing effective strategies for prevention and intervention.

Chapter 2

Literature Review

2.1 Scope of the Problem

In 1989 Winnicott came up with the concept of 'good enough parenting'. He was recognizing that parents cannot expect perfection from themselves and that they will make mistakes. Normal parental mistakes will not prevent a child from developing into a healthy adult. Knowing that we will make mistakes does not mean that we should not work to build our children's self-esteem. Families are the most important influence in children's lives. The health and well-being of children are linked to their parents' physical, emotional and social health, social circumstances, and child-rearing practices.

Stress of various sorts (e.g., financial or health problems, lack of social support, unhappiness at work, unfortunate life events) can cause parents emotional distress and cause couples conflict and difficulty with their relationship. These responses to stress then disrupt parenting and the interactions between parent and child, and can lead to short-term or lasting poor outcomes. The earlier these events appear and the longer that the disruption lasts, the worse the outcomes for children.

Previous studies have found an association between parental support and adolescent and adult reports of illness or well-being, but most of these studies have investigated the influence of parental support on mental health outcomes or on health-related behaviours (Conger et al, 1994; Whitbeck et al, 1991). Given these facts, this chapter will address the literature regarding the quality of parent-child relationship and health in later life. The chapter is

structured in three main parts: a description of the parent-child relationships, the association between parenting and health, and theories and mechanisms explaining this association.

2.2 Parent-Child Relationships

2.2.1 Definitions

Parenting is the process of raising and educating a child from birth until adulthood. The term ‘parenting’ is a derivative of the word ‘parent’ taken as a verb, and refers to ‘a relationship, a process, and a group of activities’ (Hoghughi & Speight, 1998).These activities are in relation with different parental duties.

Generally, the majority of parents admit that those duties are to provide for the basic needs of a child - the child's need for security and development. This implies physical, intellectual, and emotional security and development. Parenting is usually done in a child's family by the mother and/or father (e.g., the biological parents). When parents are unable or unwilling to provide this care, it is usually undertaken by close relatives, such as older siblings, aunts and uncles, or grandparents. In other cases, children may be cared for by adoptive parents, foster parents, godparents, or in institutions (such as group homes or orphanages) (Hoghughi & Speight, 1998).

Children have different needs that need to be fulfilled by their parents. Hoghughi & Speight refer to children’s basic needs as physical care, nutrition and protection, as well as children’s emotional needs: ‘love, care and commitment; consistent limit setting; and the facilitation of development’ (Hoghughi & Speight, 1998).

Ensuring the children’s basic needs refers to providing physical safety:

shelter, clothes, nourishment, to protect a child from dangers, physical care and to care for a child's health.

Control ‘is concerned with setting and enforcing boundaries to help the child in his/her dealings with the outside world’ (Hoghughi & Speight, 1998).

Providing physical development refers to providing conditions to a healthy growth of a child, e.g. to provide a child with the means to develop physically, to introduce to sport.

Intellectual development means providing a child with the opportunity to learn, promoting activities like reading, writing, calculating etc; moral and spiritual development refers to promoting social skills and value systems, norms and contributions to the child's belief and cultural customs.

To provide emotional security to a child means to provide a safe loving environment, give a child a sense of being loved, being needed, and welcomed. Emotional development refers to giving a child an opportunity to love other people, to care, and to help. Developing in a child an ability to love through showing empathy and compassion to younger and older, weaker and sicker, caring of others, helping grandparents, teaching a child to organize parties for other people, play with younger siblings, all of these are parts of the child’s emotional development.

Besides parental duties, the parent-child relationship consists of a combination of behaviours, feelings, and expectations that are unique to a particular parent and a particular child. The relationship influences child's development through out the child life.

2.2.2 Parenting theories

To date there is no definitive and inclusive theory of parenting, but several

theories have been proposed to explain the psychological significance of parent-child relationships. Most of contemporary research can be traced to theories and findings on social learning theory, attachment theory and parenting styles. These theories are outlined below.

Social learning theory

Bandura's social learning theory emphasizes the importance of observing and modelling the behaviours, attitudes, and emotional reactions of others. Bandura (1977) states: 'Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behaviour is learned observationally through modelling: from observing others one forms an idea of how new behaviours are performed, and on later occasions this coded information serves as a guide for action.' Social learning theory explains human behaviour in terms of continuous reciprocal interaction between cognitive, behavioural, and environmental influences. The component processes underlying observational learning are attention, retention, motor reproduction and motivation.

Applied to parent-child relationships, the social learning theory implies that children learn different strategies like managing a conflict, dealing with emotions etc from the interactions with their parents, and then apply them in other settings. The theory was mainly used in studying children's behaviour, and although initially looked at parental discipline or parental conflict, later developed a more positive approach.

The theory is mainly associated with Patterson (1969, 1988, 1989) who developed the research linking parenting with children's antisocial behaviour.

Attachment theory

The attachment theory, developed by Bowlby (1969), has led to a new understanding of child development, and was initially based on clinical studies of severely deprived of parental love and care children.

Traditionally, in research, the role of the mother in the parent-child relationship was mainly studied, because of the assumption that mothers are more likely to be the primary caregivers (Grusec, 2002). However, research on attachment has found that children are likely to form secure attachments to both parents (Cummings & Cummings, 2002).

Children develop different styles of attachment based on experiences and interactions with their caregivers. Four different attachment styles have been identified in children: secure, anxious-ambivalent, anxious-avoidant, and disorganized (Bretherton, 1992). The attachment theory has become the dominant theory used today in the study of infant and toddler behaviour and in the fields of infant mental health, treatment of children, and related fields.

Youngsters who emerge from infancy with a secure attachment stand a better chance of developing happy and healthy relationships with others (Carlson & Sroufe, 1995).

Anxious-ambivalent children, as a result with interactions with caregivers, who are not available consistently, are likely to show more expressions of distress in order to attract their parents attention; in later life they might have increased personal fears and psychosomatic symptoms, and might be prone to internalizing behaviour problems (Carlson & Sroufe, 1995).

Because their parents have ignored or rejected their signals, anxious-avoidant children see them as unresponsive, and learn to inhibit emotional

signals; as a result, their negative emotions become inappropriately redirected and later on they are at increased risk of externalizing and internalizing behaviour problems.

Children with a disorganized attachment present different odd behaviour patterns and are at a greater risk of psychopathology in childhood (externalizing and oppositional defiant disorders) (Greenberg, 1999; Lyons-Ruth & Jacobvitz, 1999).

The attachment relationship not only forms the emotional basis for the continued development of the parent-child relationship, but can serve as a foundation for future social connections.

Parenting styles

In 1971, Baumrind proposed one of the several conceptual frameworks which could be applied throughout childhood, and this has facilitated the understanding of the impact of three different styles of parenting: permissive (warm and undemanding), authoritarian (cold and demanding), and authoritative (warm and demanding). The three styles are associated with different behavioural, cognitive and social characteristics of the child.

Authoritarian parents

Authoritarian parents are rigid in their rules; they expect absolute obedience from the child without any questioning. They also expect the child to accept the family beliefs and principles without questions. Authoritarian parents are strict disciplinarians, often relying on physical punishment and the withdrawal of affection to shape their child's behaviour. Children raised with this parenting style are often moody, unhappy, fearful, and irritable. They tend to be shy, withdrawn, and lack self-confidence. If affection is withheld, the child

commonly is rebellious and antisocial (Baumrind, 1971).

Authoritative parents

Authoritative parents show respect for the opinions of each of their children by allowing them to be different. Although there are rules in the household, the parents allow discussion if the children do not understand or agree with the rules. These parents make it clear to the children that although they (the parents) have final authority, some negotiation and compromise may take place. Authoritative parents are both responsive and demanding; they are firm, but they discipline with love and affection, rather than power, and they are likely to explain rules and expectations to their children instead of simply asserting them. This style of parenting often results in children who have high self-esteem and are independent, inquisitive, happy, assertive, and interactive (Baumrind, 1971).

Permissive parents

Permissive (indulgent) parents have little or no control over the behaviour of their children. If any rules exist in the home, they are followed inconsistently. Underlying reasons for rules are given, but the children decide whether they will follow the rule and to what extent. They learn that they can get away with any behaviour. Indulgent parents are responsive but not especially demanding. They have few expectations of their children and impose little or inconsistent discipline. There are empty threats of punishment without setting limits. Role reversal occurs; the children act more like the parents, and the parents behave like the children. Children of permissive parents may be disrespectful, disobedient, aggressive, irresponsible, and defiant. They are insecure because they lack guidelines to direct their behaviour. However,

these children are frequently creative and spontaneous. Although low in both social responsibility and independence, they are usually more cheerful than the conflicted and irritable children of authoritarian parents (Baumrind, 1971).

2.2.3 Other aspects of the parent-child relationship

Some other aspects of the parent-child relationship are also important. Based on child abuse literature, in 1984 Belsky proposed a parenting model that looked at the relationship between parent characteristics (e.g. personality, attachment history), child characteristics (e.g. temperament) and family environment (e.g. family stress).

Social factors

Further on, the research on child development began to extend its scope from proximal family factors mentioned above to social context distal factors like socioeconomic status, race/ethnicity, neighbourhood characteristics, culture considered 'ecological factors' by Bronfenbrenner (1979).

The influences of these social factors on parenting have been discussed by different researchers.

In regards to culture and ethnicity, Bradley et al (2001) and Kelley, Power, & Wimbush (1992) discussed ethnic group differences in physical punishment use, with Afro-American parents being more inclined to use it as a discipline strategy comparing with White, Asian or Latino American parents.

Also, the effect of socioeconomic status on family life and parent-child relationships has received a great deal of attention during the last two decades. There were a few research lines that linked family financial resources and the effect on parenting.

Elder looked at the effect of socioeconomic status on the family psychosocial

functioning during the Great Depression (Elder et al, 1984; Elder et al, 1985). He found that economic hardship negatively affected children through its disruption of parenting and other family processes. Specifically, financial loss was associated with fathers' increased irritability, depression, and explosive behavior, which, in turn, were associated with harsher and more arbitrary discipline practices. It was these disruptions in parenting which led to increased behavioral and socoioemotional problems among the children studied.

Parental characteristics

Parenting style is shaped by the parent's developmental history, education, and personality, and the immediate and broader context of the parent's life. Parental self-confidence is very important, especially for young parents (Percy & McIntyre, 2001). Also, mothers who see themselves as effective also tend to believe their infants are less difficult to handle. Parental age and previous experience are also important. Older mothers tend to be more responsive to their infants than younger mothers. In addition, parents who have had previous experience with children, whether through younger siblings, career paths, or previous children, are often better able to cope with parenthood.

Family events

The link between parent-child relationship and other family domains has been studied since 1970s, when family was seen as a social system composed of marital, parent-child and siblings subsystems (Belsky, 1981; Lamb, 1976, Sroufe et al, 1985). Regarding the interrelatedness between marital and parent-child relations, a meta-analysis of 68 studies conducted in

1995 by Erel found that most of the studies were in favour of the ‘spillover hyphothesis’ that implies that a positive marital relationship quality is associated with a positive parent-child relationship quality, and a negative marital relationship quality with a negative parent-child relationship quality (Erel & Burman, 1995).

Divorce can also interfere with the child's needs.

Divorce is a growing epidemic in today's world. More and more families are becoming members of one or more stepfamilies, and children are finding themselves in the majority if they have divorced parents. There has been a great amount of research conducted on divorce and how it affects children. Divorce not only contributes to problems in young children, but it also has been known to cause emotional problems and parent and child separation in young adults.

Prior to the research performed by Cherlin, Chase-Lansdale, & McRae (1998), there were very few studies that focused upon what the effects of parental divorce have upon children as they grow up and become adults themselves; whether they increase or decrease or stay the same. This study primarily focused on the pre-disruption effects’ and the ‘post-disruption effects’ (disruption being the divorce itself) upon a cohort of people that were followed from birth to the age of 33. The study is known as the National Child Development Study, and consisted of 11,759 subjects who were born in England, Scotland, or Wales in the first week of March in 1958. The subjects also had to be from a family in which both the parents were still married by the time the child turned 7. The study concluded that children that experienced divorce by the age of 22 showed a higher level of emotional

problems at age 7, when compared to those who did not experience a divorce by the age of 22. Post-disruption emotional effects were only seen in those that experienced a divorce in young adulthood. This was mainly because the children that showed pre-disruption effects had a constant increasing line of emotional problems into adulthood that was not increased more by the divorce.

Child's characteristics

The idea that parent-child relationships are bidirectional has being accepted in the literature on child socialisation (Patterson & Dishion, 1988). Characteristics that may affect the parent-child relationship in a family include the child's characteristics such as physical appearance, sex, and temperament. For example, in one of his studies, Kochanska (1997) reported that for temperamentally shy children, gentle parental control was associated with positive behavioural and emotional regulation, where more temperamentally aggressive children required more control to achieve the same good results.

The dimensions of the parent-child relationship are also related with child's age, because this relationship is a dynamic process, and there are developmental changes which occur from childhood to adolescence.

Infancy

In infancy, as babies are cared for by their parents, both parties develop understandings of the other. Gradually, babies begin to expect that their parent will care for them when they cry, and parents respond to and anticipate their baby's needs. This exchange and familiarity creates the basis for a developing relationship.

One of the most important aspects of infant psychosocial development is the infant's attachment to parents (Bowlby, 1969). This significant bond between infant and parent is critical to the infant's survival and development. Started immediately after birth, attachment is strengthened by mutually satisfying the interaction between the parents and the infant throughout the first months of life, called bonding. When parents can adapt to their babies, meet their needs, and provide nurturance, the attachment is secure (Bowlby, 1979).

Toddlerhood

When children move from infancy into toddlerhood, the parent-child relationship begins to change. During infancy, the primary role of the parent-child relationship is nurturing and predictability, and much of the relationship revolves around the day-to-day demands of caregiving: feeding, toileting, bathing, and going to bed.

As youngsters begin to talk and become more mobile during the second and third years of life, however, parents usually try to shape their child's social behaviour. In essence, parents become teachers as well as nurturers, providers of guidance as well as affection. Socialization (preparing the youngster to live as a member of a social group) implicit during most of the first two years of life, becomes clear as the child moves toward his or her third birthday (Bowlby, 1979).

School age

During the elementary school years, the child becomes increasingly interested in peers, but this is not be a sign of disinterest in the parent-child relationship. Rather, with the natural broadening of psychosocial and cognitive abilities, the child's social world expands to include more people

and settings beyond the home environment. The parent-child relationship remains the most important influence on the child's development. Children whose parents are both responsive and demanding continue to thrive psychologically and socially during the middle childhood years.

During the school years, the parent-child relationship continues to be influenced by the child and the parents. In most families, patterns of interaction between parent and child are well established in the elementary school years (Bowlby, 1979).

Adolescence

As the child enters adolescence, biological, cognitive, and emotional changes transform the parent-child relationship. The child's urges for independence may challenge parents' authority. Many parents find early adolescence a difficult period. Adolescents fare best and their parents are happiest when parents can be both encouraging and accepting of the child's needs for more psychological independence (Allen et al, 2002).

Adolescence may be a time of diminished closeness in the parent-child relationship, but most disagreements between parents and young teenagers are over less important matters, and most teenagers and parents agree on the essentials. By late adolescence most children report feeling as close to their parents as they did during elementary school.

Child abuse and neglect

Child abuse is the negative end of the quality of parent-child relationship, and it is very important to understand the epidemiology of child abuse in today’s world.

Different forms of child abuse and neglect (neglect, physical abuse, emotional abuse, sexual abuse) can result in 'non-accidental injury' to a child or young person.

Epidemiology of child abuse and neglect

Registers of non accidental injury to children exist in local authorities in England, Wales and Northern Ireland, but represent a fraction of cases actually occurring. Recent registration rates of all types of child abuse and neglect in the United Kingdom (UK) are given in Table 2.1 (Creighton, 2002).

Table 2.1 Children on the Child Protection Register, UK

Country	Number of registrations	Year	Rate per 1,000 child population
England	29300	March 2000	2.6
Northern Ireland	1093	March 1999	2.6
Scotland	1919	March 1998	1.9
Wales	2516	March 1999	3.7

Research published by Creighton investigated self-reported child abuse and neglect in a sample (N=2,869) of young adults aged 18-24 (Table 2.2). The prevalence of different types of child abuse and neglect lied between 6-16%.

Table 2.2: Self-reported prevalence of child abuse and neglect, UK 1999

Type of child maltreatment	Prevalence (%)
Serious physical abuse (violence over years frequently causing physical effects or which had caused physical injury).	7
Serious absence of physical care (acts which carried a high risk of injury or long-term harmful effects).	6
Serious absence of supervision (staying home overnight without adult supervision < 10 yrs or allowed out overnight < 14 years when carers do not know whereabouts.	5
Serous emotional maltreatment (a score of 7 or more on experience of at least 4 of the following dimensions: control and domination; humiliation; withdrawal; antipathy; terrorising; proxy attacks).	6
Sexually abused (contact and non-contact) (against wishes or aged 12 and under).	16
Sexually abused (contact) (against wishes or aged 12 and under)	11

Several factors make the interpretation of changes in the incidence and prevalence of non-accidental injury over time difficult; these include the following (Browne, 2002):

1. Changes to the criteria needed for a child to be 'registered' on the Child Protection Register. A change in emphasis from child abuse to child protection has resulted in changes to the threshold for investigating and recording cases of non-accidental injury.
2. Changes in service delivery which can alter the ascertainment of cases and suspect cases of child abuse and neglect.
3. Increased public awareness about the spectrum of child abuse and neglect which is likely to have increased the ascertainment of cases and suspect cases of child abuse and neglect.

Immediate physical and emotional consequences of child abuse and neglect include physical injury such as fractures, burns, sexually transmitted infections, neural atrophy; psychological effects such as depression, anxiety, shame and problems in forming relationships with carers and peers (insecure attachment), and educational failure (Department of Health, 2000).

Later consequences of child abuse and neglect arise largely as a consequence of problems forming relationships and problems with social adjustment.

Child abuse and neglect is multi-factorial in aetiology and has consequences that impact on a wide range of services including social services, health, education and the justice system. Any attempt to prevent the occurrence and potential sequelae of child abuse and neglect has therefore to be multi-agency in nature. At present services for child abuse and neglect are usually

triggered by an episode of abuse and this limits the amount of prevention work that can be done at the individual level. Currently little primary preventative activity (avoidance of the occurrence of child maltreatment) at an individual level occurs. Rather the focus is on secondary prevention (avoidance of the immediate consequences of child maltreatment) and tertiary prevention (reduction/limitation of long-term sequelae) (Browne et al, 2002).

2.3 Parent-Child Relationships and Health in Later Life

2.3.1 Previous research

The association between the quality of parent-child relationship and health in later life was investigated by different studies but there are issues regarding its heterogeneity, specificity, consistency, and generalisation.

There is a vast heterogeneity regarding the expression of exposure and outcome variables. Studies take in consideration different aspects of the parent-child relationship associated with different symptoms or diseases, and the evidence of a good specificity is poor. Also, the association is not always proved, or its effect size is different from study to study. These differences are due to the sample data collection and again the nature of the exposure and outcome variables.

This literature review will mainly focus on longitudinal research that could provide more robust evidence of causality than other observational studies designs.

Most of the longitudinal studies looking at the impact of childhood conditions on later life have concentrated on mental and social outcomes (Pulkkinen, 1990; Pulkkinen, 1992; Gottman, Katz, & Hooven, 1996; Newcomb, 1997)

but there are some studies which suggest that an impact on physical health is possible (Lundberg, 1993; Lundberg 1997; Russek & Schwartwz, 1997; Thomas, Duszynski, & Shaffer, 1979).

Previously, cohort studies with shorter follow ups mainly focussed on the quality of parent-child relationship and the prevalence of child or adolescence injuries (Schwebel et al, 2004).

Other studies with longer follow ups have focused on the impact of parent-child relationship on common symptoms or general measures of health (Pulkkinen, 1990; Pulkkinen, 1992; Gottman, Katz, & Hooven, 1996; Newcomb, 1997; Feldmann, Fisher, & Seitel, 1997; Wickrama, Lorenz, & Conger, 1997), or on specific adult diseases such as cancer (Russek & Schwartwz, 1997; Thomas, Duszynski, & Shaffer, 1979), cardiovascular disease (Orth, Rosengren, & Wihelmsen, 1993), or asthma (Askildsen, Watten, & Faleide,1993).

A series of studies published in the 80s' by a group of researchers at the Johns Hopkins Medical School has looked at the relationship of psychological attitudes, characteristics and symptoms in young persons to cancer, coronary occlusion, hypertension, suicide and mental illness in middle age (Thomas, Duszynski, & Shaffer, 1979). The participants were white male students studying between 1949 and 1964 at the Johns Hopkins Medical School. Although these studies have a poor presentation of the results, some findings appear robust, showing that medical students who developed malignant tumours or mental ilnesses in later life reported a less positive relationship with their parents than healthy students (Thomas, Duszynski, & Shaffer, 1979).

Other studies published Russek and Schwartwz have looked at the impact of Harvard Medical School male students' perceptions of parental care and love, on disease prevalence (including hypertension, coronary artery disease, duodenal ulcer, and alcoholism) 35 years later. The results are again striking, showing that the healthy group generated a positive perception of parental caring, and used more positive narrative descriptors for their parents (Russek & Schwartwz, 1997, Journal of Behavioural Medicine; Russek & Schwartwz, 1997, Psychosomatic Medicine).

In Sweden, an important study has been undertaken by Lundberg, showing that adverse childhood conditions, especially family conflict, from birth to the age of 16, have a negative effect on health in adulthood. The relationship was not likely to be caused by differences in age, sex, or class between the exposed and the unexposed children, nor by differences in reporting behaviour. This study found that musculoskeletal conditions and circulatory illnesses could be predicted by dissension in the family (Lundberg, 1993; Lundberg 1997).

Body weight and obesity in adulthood were also related with self-reported childhood verbal, physical and sexual abuse in a study by Williamson et al (2002).

2.3.2 Measuring the quality of parent-child relationship

Most of the studies linking the quality of the parent-child relationships in the home with future health use a broad range of measures to describe this quality. Some of the studies discuss family cohesion and support (Lundberg, 1997), parental 'monitoring' (knowledge of the child's activities and friends) (Pulkinen, 1990), or the type of conflict: between parents (Johnston,

Gonzalez, & Campbell, 1987), or family conflict in general (Mechanic & Hansel, 1989). There are also studies that use validated instruments which include some aspects of the parent-child relationship like the Family Environment Scale.

Some other studies use the Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell, & Bradley, 1984) which is designed to measure the quality and quantity of stimulation and support available to a child in the home environment. Although used extensively in research, one of the most serious restrictions of this inventory is the lack of a standardised procedure for administration, and because of this the Department of Health commissioned a new Framework of Assessment to be developed (Gray, 2002) that uses a semi-structured methodology to extend the HOME.

The Parental Bonding Instrument (PBI) is another common instrument used in parenting research. It is a 25-item self-report measure using a 4 point Likert response format, assessing the individual's perception of his or her parents during the first 16 years of life (Parker, Tulping, & Brown, 1979). There is considerable support for its validity as a measure of both actual and perceived parenting, based on studies using family corroborative witnesses, twin studies, and studies using independent ratters (Parker, 1989).

Child abuse research is often compromised by instruments of questionable reliability and validity (Walsh et al, 2004). Using a single general question is not likely to be sufficient. Multiple questions trigger more reports than single ones and specific questions are likely to result in greater accuracy than general questions (Hardt & Rutter, 2004). Some studies, for example, ask a very general question

such as 'Were you physically abused as a child?'. Unless abuse is defined for responders, the answers could bring about a blurring of categories, where very mildly abused could be categorized as abused and moderately abused categorized as not abused.

The measures used to describe the quality of parent-child relationship does not seem to be related in most of the studies with the theories behind parenting definition. The methodology used in these studies is based on questionnaires, interviews, observation or the latest 'goal-standard' called 'multiagent multimethod' (O'Connor & Scott) that uses several observers (parents, teachers, home visitors, child self-reports) for each approach. Researchers are not always aware that their findings are influenced by the methodology they use, and that usually both exposure and outcome variables in relation with parenting should be assessed by the same methods (O'Connor & Scott).

Different 'constructs' are sometimes used to express the quality of parent-child relationship like warmth, conflict, coercion, rejection, control, monitoring or the ones defined by Baumrind (1971): authoritative, authoritarian, permissive, but there is no consistency in how these dimensions should be assessed and if all or only some should be assessed in order to have good quality research (O'Connor & Scott).

2.3.3 Measuring health

Determining the health of an individual is dependent on how health is defined. The definition of health is an area of debate (Bowling, 1991). Larson (1991) describes definitions of health based on different models: medical, holistic, wellness and environment models. The medical model, a widely accepted model, simply defines

health as the absence of disease. While this is easily measured, critics point out that health is a more multi-dimensional concept. The holistic model defines health as physical but also extends the definition to encompass mental and social aspects. The World Health Organization definition includes these dimensions and defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1998). Next, Larson describes the wellness model which focuses on a subjective feeling of physical well-being, comfort, energy and ability to perform. Finally, the environment model defines the health of an individual to the degree which he or she adapts to the environment (Larson, 1991). As the concept of health evolves, indicators measuring aspects of health became necessary. Since it is not possible to measure health directly, valid health indicators are used to provide information about the health of the individual. There is no clear consensus on how best to measure health, but methods have been evolving over time (McDowell & Newell, 1987). A common approach to measuring population health is the study of mortality statistics e.g. infant mortality or crude death rates (Larson, 1991). These data are used in estimating the overall health of different countries. In developed countries, more subtle health indicators are sought. Commonly used indicators are medical tests such as blood and urine tests, blood pressure readings, electrocardiograms or physical examinations. These tests give objective data but are prohibitively expensive in large studies and may provide a very restricted range of health outcomes. Population health is usually studied through the use of questionnaires which ask the respondent about various dimensions of health. These self-report indices are widely used, simple to administer and are low in cost (Bowling, 2005).

Health measures can be divided into two broad categories: disease-specific measures and generic measures (Bergner & Rothman, 1987). The advantages of disease-specific measures are that they are sensitive, specific and relevant to the disease under study. Generic measurements on the other hand, are robust, have been tested in a variety of situations and allow direct comparisons of various populations. When addressing questions of public health concern, the measures must discriminate at the positive end of the continuum, since most people in the general population exhibit minimal dysfunction.

In deciding which health measure to use, one must consider several issues. First, the data produced by the measure must provide answers to the research question. Ideally, the measure should also take into account the various effects of health and illness. Moller, Kristensen and Hollnagel (1996) list medically diagnosed health, self-rated health and functional ability as important components to be measured. The health measure should have been demonstrated as being reliable and valid. Depending on the population being studied, some practical considerations must be taken into account, such as the time required for administration of the measure and the mode of administration. As in the case of abuse measures, it is better to have multiple questions than single items because this provides increased validity and reliability (Ware, 1976).

2.4 Life Course Epidemiology

Different theories could be used to explain the association between the quality of parent-child relationship and health in later life. This thesis's approach is based on life course epidemiology.

Human health and development evolves throughout an individual's life. Efforts to support growth and development in childhood have, in addition to

their value for the individuals at the time, a common aim: to prepare for a healthy adult life. The benefits of healthy development in the first years of life are reflected not only in adult health, but also in the next generation and perhaps the next several generations.

A life course approach emphasises a temporal and social perspective, looking back across an individual's or a cohort's life experiences or across generations for clues to current patterns of health and disease, whilst recognising that both past and present experiences are shaped by the wider social, economic and cultural context. In epidemiology, a life course approach is being used to study the physical and social hazards during gestation, childhood, adolescence, and adulthood that affect chronic disease risk and health outcomes in later life. It aims to identify the biological, behavioural and psychosocial processes that operate across the life span (Kuh & Ben-Shlomo, 1997).

A life course approach incorporates, but is broader than, 'the foetal origins hypothesis' (programming) which links conditions in the intrauterine environment to the later development of adult chronic disease (Barker, 1998). Growing evidence suggests that there are critical periods of growth and development, not just in utero and early infancy but also during childhood and adolescence, when environmental exposures do more damage to health and long-term health potential than they would at other times. There is also evidence of sensitive developmental stages in childhood and adolescence when social and cognitive skills, habits, coping strategies, attitudes and values are more easily acquired than at later ages. These abilities and skills strongly influence life course trajectories with implications for health in later

life. Additionally, a life course approach considers the long term health consequences of biological and social experiences in early and mid adulthood, and whether these factors simply add additional risk or act interactively with early life biological and social factors, to attenuate or exacerbate long term risks to health. Examples regarding these models will be provided further in this section.

Using the life course approach, Kuh and Ben-Shlomo (1997) suggest that beginning life in a socially compromised position and being exposed to adverse factors during gestation, childhood or adulthood have long term effects on health. Factors included in the Kuh model are childhood socioeconomic environment, education, childhood and adolescent health behaviour, and development of health capital.

These have long term influences on adult socioeconomic environment and health behaviour which in turn impact health outcomes.

Rutter (1989) illustrates the life course perspective by describing how childhood influences lead to beneficial or detrimental behavioural changes which in turn lead to further positive or negative events. An example of a positive influence is that academic success leads to a better job, which leads to better health. Human development, according to Rutter, extends throughout the lifespan into adulthood. Reflecting on the Isle of Wight longitudinal studies, he suggests that understanding the mechanisms which influence development over the span of one's life is crucial to devising ways of improving the long-term gains of children suffering from adversity: ‘Studying both protective and risk factors is important in elucidating development. Most crucially, however, they (biological substrates and psychosocial influences) are not independent of one another. To an important extent the past

helps to determine the present environment through a variety of different mechanisms. Chain effects are common and, if we are to understand the developmental process, we need to analyze each of the links in the chain, to determine how the links interconnect and to study how changes in life trajectory come about. In this way, life transitions have to be considered both as end products of past processes and as instigators of future ones - in data analysis terms as both independent and dependent variables. It is important to search for unifying principles in the mechanism underlying the diversity of pathways from childhood to adult life, but in so doing we must consider the pathways in personal terms and in the context of possible person-environment interactions. The elucidation of the process giving rise to these varied pathways should provide useful leads for both prevention and treatment through improved knowledge on how changes take place, for that is what development is all about.' (Rutter, 1989, pp. 46)

The life course approach may be viewed from an individual perspective to a population health perspective. Bartley, Blane and Montgomery (1997) indicate that a life course approach is necessary to understand social variations in health. Health in old age is influenced by social policy directed at various points of the life span. Keating and Mustard (1996) discuss the importance of gaining insight into population patterns arising from individual life courses and of understanding the biological pathways which explain childhood and adult outcomes. Hertzman and Weins (1996) point to the devastating effects on health of political changes in Eastern and Central Europe in the early 1990's to illustrate that 'the diversity of conditions of life can somehow become imbedded in human biology, such that human vitality can be directly affected by social hierarchies in a consistent manner across wide expanses of space and time.' (Hertzman & Weins, 1996, pp. 1086).

Using data from the 1958 British Birth Cohort Study, Hertzman, et al (2001) found that reading ability, height, parent reading to child and socio-emotional status at age 7 predicted self-rated health at age 33. They discuss three processes that explain how early life environment influences health in later life: latency factors, pathway factors and cumulative effects.

2.4.1 The latency model

The latency model explains how discrete events occur at critical and sensitive periods in human development. Research has shown that neglect of young rats is linked with biological changes that endure into adulthood (Heim, et al, 1997). Associations have been found between birth weight, placenta size and weight gain in the first year of life with cardiovascular disease in adulthood (Barker, 1998). Some developmental tasks, such as learning languages are best started early in life. Children who grow up in English-speaking homes have a reduced ability to make the guttural sounds common in German and Japanese (Cyander & Frost, 1999).

2.4.2 The pathway model

The pathway model describes a process acting over a longer period of time. Early childhood environments influence life trajectories that in turn affect adult health. For example, Kuh et al (2004) found that mortality rates in males with lower cognitive ability in childhood were twice as high as males with higher cognitive ability in childhood. They explained that good cognitive ability can affect long term health through information processing, having a safe adult environment and engaging in healthy behaviours. Those with poor cognitive ability tended to have lower educational attainment and increased risk of poor health. In practice, distinguishing latent effects from pathway effects is not always possible.

2.4.3 The cumulative model

The third process recognizes the importance of cumulative effects of risk factors over time. Duration and frequency of child abuse have been shown to influence child outcomes (Green, 1993). Intervening in pathway and cumulative effects involves rectifying difficulties at several points across the life span to move the individual along the pathway to healthier development. The processes have different policy implications. Focusing on latency effects would target interventions on early childhood development while pathway and cumulative effects would include investments at various points in the life cycle. Hertzman (1994) argued that both latent and pathway effects are relevant. While there are critical periods in all primate development, for humans these periods may be better labelled as sensitive. Certain stimuli applied later in life can promote cognitive and emotional development. 'The worst possible outcome would be to reduce the argument to the notion that a cradle-to-grave social contract is the policy corollary of the pathways model and a one-shot early childhood social investment strategy is the policy corollary of the latency model. What is needed instead is a pragmatic approach which draws upon the strengths of each model' (Hertzman, 1994, pp.17).

2.4.4 Social inequalities

The life course approach has been mainly used in research on social inequalities in health, to investigate how experiences and exposures at different life stages accumulate and create the social inequalities in morbidity and mortality observed in middle and old age (Davey Smith, 2000). Socioeconomic status is one of the most studied factors in the social environment and its effects on children's health are usually considered as distal, mediated by other proximal factors such as parenting.

Other theories consider economic restrain as a modifier of other risk processes. However, most of the research is based on the first hypothesis, and it is important to realise that improving socioeconomic conditions in children's lives would not necessary mean that it will bring positive changes in their health, as there are other mediating factors intervening. Improving the quality of the parent-child relationship could be in this case more important, even if those families will still be confronted with financial problems.

Critical questions include: Is poverty bad for children simply because families lack money, or because of other family characteristics that are associated with poverty? What kinds of investments will improve children's outcomes- additional services for low-income families or financial support?

There are three primary reasons why low income can adversely affect children's lives. First, if resources are low, children do not receive the nutrition they need for healthy development. Second, economic pressures can adversely affect parental emotional well-being and parenting practices. Elder and his colleagues in a study of 429 inner-city Philadelphia families found that low income and unstable work/income patterns increased the risk of parental emotional distress which adversely affected parents' beliefs about their own efficacy and their parenting strategies (Elder et al, 1995).

Third, low income can adversely affect children's lives through the neighbourhoods in which they reside. Low income families are often forced to live in neighbourhoods that are beset by problems. Elder and his colleagues in the study noted above, found that White participants described their neighbourhoods more favourably than did Afro-Americans and had access to more services (Elder et al, 1995).

Many policy makers are wondering if the best approach would be to offer more employment opportunities to parents of young children or to promote educational programmes for parents which will potentially improve the quality of the parent-child relationship.

Summarised below are three studies which illustrate the effects of parental socioeconomic status on children's outcomes, and the fact that interventions aimed at improving only living conditions, without targeting the quality of parent-child relationship, would not necessary have a beneficial effect on the health of children.

The Child Outcomes Study of the American National Evaluation of Welfare-to-Work Strategies (Hamilton, Freedman, & McGroder, 2000). examined the impacts on both parent and child of two distinct approaches to welfare reform implemented as part of the federal Job Opportunities and Basic Skills Training (JOBS) Programme: a labour force attachment approach (emphasizing a rapid transition to employment), and a human capital development approach (emphasizing a longer-term strategy of education and training in order to obtain a better job).

The study examined whether different aspects of young children's development (specifically their cognitive development and academic achievement, behavioural and emotional adjustment, and health and safety) were affected two years after their mothers were assigned to participate in a JOBS welfare-to-work programme. It also asked whether aspects of family life that are important to children's development (for example, the stimulation and support available to the child in the home environment, participation in child care, and poverty status) changed when mothers participated in the

programme. Finally, it explored the linkages between changes in family life and programme impacts on children's developmental outcomes.

The results indicate that the programme did have significant impacts on children's developmental outcomes, but these impacts were not widespread and were generally small. When impacts did occur, they were favourable in the area of the children's cognitive development and academic achievement, unfavourable in the area of the children's health and safety, and mixed in the area of behavioural and emotional adjustment.

The Minnesota Family Investment Program (MFIP) was another intervention that implemented two complementary policies: financial incentives to reward work and reduce poverty and, for long-term welfare recipients, mandatory participation in employment-focused services to encourage work and reduce dependence (Knox, Miller, & Gennetian, 2000).

MFIP's effects on families' economic circumstances led to a series of important changes in family life: an important decline in domestic abuse, a modest increase in marriage rates, and, for children, better performance in school and fewer behavioural problems, but did not have an effect on their physical health.

Another intervention, New Hope, relied on several components and services to increase the income, financial security, and access to fulltime employment of low income workers in two areas of Milwaukee (Bos et al, 1999). Overall, New Hope increased employment and earnings, leading in turn to increased income during the first year of follow up and enabling more low-income workers to earn their way out of poverty. New Hope's effects on employment and income, coupled with its provision of health insurance and child care

subsidies, set off a chain of beneficial effects for participants' families and their children. On average, New Hope participants were less stressed, had fewer worries, and experienced less material hardship (particularly that associated with lack of health insurance) than control group members. Participants' children had better educational outcomes, higher occupational and educational expectations, and more social competence; boys also showed fewer behaviour problems in the classroom (Bos et al, 1999).

In conclusion, these interventions did not have a significant effect on children's health; they were more likely to affect their educational and social outcomes. However, because family poverty limits opportunity and increases the likelihood of a variety of risk factors, it remains one of the strongest predictors of diminished health and well-being for children.

2.5 Mechanisms Explaining the Association between Poor Parent-Child Relationships and Health in Later Life

The early care and nurture mechanisms are important for the development of the emotional brain, and the normal development of the hypothalamic-pituitary response to stress (Blair et al, 3003). Human and animal studies have shown that in infants who did not receive an adequate level of nurture care, the emotional brain composed of the prefrontal cortex, hippocampus, and amigdala is poorly developed (Gunnar, 2000). Other studies of children from orphanages who have been subjected to chronic stress and maltreatment have shown an important disequilibrium of the normal cortisol biorhythm, that later has been linked with an increased risk of morbidity (Repetti, Taylor, & Seeman, 2002).

These physiological mechanisms will be explained further.

The stress response begins in both the nervous system (which reacts almost immediately) and the endocrine system (which reacts more slowly). The two major stress response systems are the sympathetic-adrenal medullary (SAM) system (the nervous system's response) and the hypothalamic-pituitary-adrenal (HPA) axis (the endocrine system's response). These two systems function to create a precise homeostatic balance. The problem with chronic stress lies in the fact that the SAM system and HPA axis are not isolated systems and they impact numerous biological functions. Thus, they have the potential to protect or harm other parts of the body such as the immune system, the reproductive system, the gastrointestinal tract, or the cardiovascular system.

2.5.1 The SAM system

The SAM system is commonly referred to as the 'fight or flight' response because it prepares the body to run away from a stressor or stay and fight it. Directly when the central nervous system (CNS) is activated by stress, there is a sympathetic stimulation of target organs (Figure 2.1). Norepinephrine (NE) releasing sympathetic fibres originate in cranial nerves and reach out to stimulate target organs, and these are rapidly activated by second messenger systems in postsynaptic tissues. The SAM system is activated to release catecholamines (CAs) into the blood: NE (which has long term effects on target organs) and epinephrine hormone.

CAs are mainly suppressive upon anabolic functions like growth, reproduction and gastrointestinal functions. The SAM activation increases pupils size, perspiration, heart rate and lung function, depletion of energy stores, and contraction of blood vessels, in a body prepared to take action.

2.5.2 The HPA axis

The HPA axis is mainly involved in the long-term stress response. The purpose of the HPA axis is to increase the amount of usable energy in the body and direct it to the places it is most needed. The HPA axis begins in the hypothalamus, which communicates with other parts of the brain and body, and produces hormones that either stimulate or inhibit the release of other hormones from the anterior pituitary. Corticotrophin-releasing factor (CRF) is secreted from hypothalamic parvo-ventral nucleus (PVN) into the pituitary portal circulation. This leads to release of adrenocorticotrophic hormone (ACTH) from the pituitary gland into the circulating blood, and is in a few minutes transported to receptors in the adrenal cortex. Depending on the level of ACTH the adrenal cortex secretes corticosteroids, mainly cortisol (Lupien & Lepage, 2001). Normally, the HPA-axis is inhibited through a negative feed-back loop, which regulates cortisol levels back to normal. Release of CRF, ACTH and cortisol helps to down-regulate stress hormone release, but if the axis has become dysfunctional the feedback does not work. This leads to chronic high levels of cortisol, which may induce neuropathological effects (de Kloet, Joels, & Holsboer, 2005). Cortisol also stimulates gluconeogenesis (creation of glucose) to ensure an adequate fuel supply; increases mobilization of free fatty acids, making them a more available energy source; decreases glucose utilization; stimulates protein catabolism to release amino acids for use in repair, enzyme synthesis, and energy production; acts as an anti-inflammatory agent; depresses immune reactions; and increases the vasoconstriction caused by epinephrine.

2.5.3 Stress consequences

The main purpose of the two adaptation systems, the nervous system and the endocrine system, is to maintain homeostasis in different external environments. When the adaptation is not working there is a strain on bodily functions (McEwen, 2000).

With chronic stress comes a multi-integration of different diseases like cardiovascular diseases, such as arrhythmia, hypertension and increased risk of coronary heart disease; metabolic changes like insulin resistance, high cholesterol values, and obesity; mental disorders like anxiety, depression, and sleep disturbance (Björntorp et al, 2000; Melamed, Kushnir, & Shirom, 1992; Nilsson et al, 2001).

2.5.4 Serotonin

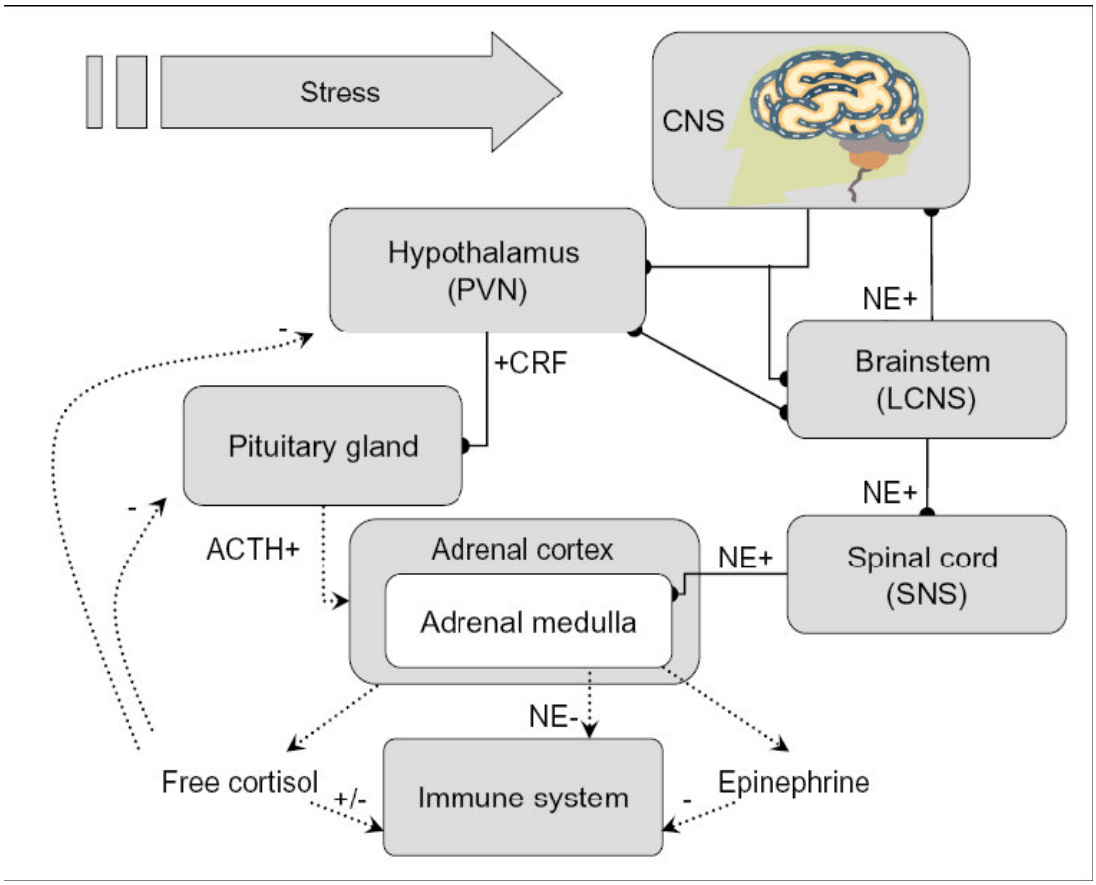
Serotonin (5-hydroxytryptamine, or 5-HT) is a monoamine neurotransmitter synthesized in serotonergic neurons in the CNS and enterochromaffin cells in the gastrointestinal tract.

In the CNS, serotonin is believed to play an important role in the regulation of mood, sleep, emesis, sexuality and appetite. Serotonin has been thought to play a part in many disorders, notably as part of the biochemistry of depression, migraine, bipolar disorder and anxiety. Recent research suggests that serotonin also plays an important role in liver regeneration and acts as a mitogen (induces cell division) throughout the body (Lesurtel et al, 2006).

Cortisol normally enhances the transport of serotonin both in neural tissue and by lymphocytes, but in chronically stressed or depressed individuals the transport limit is reached due to dysregulation of HPA axis and serotonin

levels in synapses are downregulated. This in turn leads to impaired serotonergic activation, which provides a link between chronic stress and depression (Tafet et al, 2001).

Figure 2.1 Interacting stress response in immune and neuroendocrine systems (Solid lines, neural circuits; dotted lines, hormonal influences; +, activation; -, inhibition)



Source: Ohman, 2006

2.5.5 Linking risky family environment and alterations in SAM and HPA systems

The question is: how the previously presented mechanisms work in real life? Recently, the link between early experience, brain development, and both normal and disordered functioning has become increasingly understood. This is due largely to evidence that early experience (especially deprivation experiences) reduces neural plasticity to stress experienced later in life (Mirescu, Peters, & Gould, 2004) and even permanently silences genes critical to the regulation of the stress response (Weaver et al, 2004).

The human HPA axis comes under strong social regulation or buffering during early development. In the early months of life, however, being held and soothed by the mother or other adults does little to reduce cortisol responses to stressors such as being physically manipulated (e.g. during a doctor's exam) (Gunnar, 2000). Thus, over the course of the first year of life, the HPA axis comes under strong social regulation and the social buffer is more potent if the child is securely attached to the caregivers. Over the toddler and preschool years, children become increasingly motivated to play with other children, and their social skills which are just emerging, make peer play challenging. The importance of peer relations is demonstrated by evidence that as early as the preschool years, peer rejection is associated with chronic elevations in cortisol levels when children are with their peers (Gunnar et al, 2003). It was also found that conflict in the family environment is a powerful activator of cortisol during middle childhood and adolescence, while a positive, stable, supportive home environment is associated with lower cortisol levels (Repetti, Taylor, & Seeman, 2002). Fewer studies have examined social factors influencing HPA axis activity specifically in adolescents, which is surprising given the importance of changing peer and family relationships, combined with the many other changes in physical appearance, physiology, sexuality, and social roles of this age period. The convergence of all these changes in a short period of time is thought to contribute to the experience of high levels of stress in adolescence. Recent evidence also implicates ongoing brain development as a factor in the increased emotionality and risk taking during the adolescent years (Dahl, 2004). In addition, a number of studies suggest that a small increase in basal

cortisol levels occurs across mid- to late adolescence, perhaps especially in adolescents girls (Elminger, Kuhnel, & Ranke, 2002; Netherton et al, 2004-in girls only).

In conclusion, research on social influences on the HPA axis leads to the conclusion that providing children and adolescents with supportive family and social environments that promote positive emotion and feelings of safety and security is good for them and their development, and that adverse environments can influence children's and adolescents' mental and physical well-being.

2.6 Thesis Approach

In order to assess the relationships between parenting and health in later life, the life course approach was considered to be the most appropriate one for this thesis. A framework built on this approach illustrates the complex ways different factors can interact in the development of adult health. It encompasses psychosocial and biological factors. Latent, cumulative, and pathway effects are considered. In the latent model, childhood can be deemed a critical period where the individual is particularly vulnerable to the effects of trauma. The pathway approach also applies as poor parent-child relationships may trigger a series of other events which negatively affect health.

The framework used in this dissertation to describe pathways between parenting and health care utilisation is a modified version of Kuh and colleagues' framework. (1997). While Kuh and colleagues' original model focused mostly on the socioeconomic environment, along with education, childhood and adolescent health behaviour, and development of health capital, this thesis model includes the quality of parent-child interaction as well as other characteristics of the child's environment.

This framework illustrates how, through various pathways, early stages of the life course can influence health in later stages.

It is beyond the scope of this thesis framework to examine all the factors laid in Kuh and colleagues' framework (1997), as data on some factors were not available. The study will focus on the quality of parent-child relationship and on health care utilisation in later life. While the quality of parent-child relations and parenting were concepts discussed earlier in this chapter, health care use as a proxy measure for health will be discussed in the following section.

2.7 Determinants of Health Care Utilisation

2.7.1 Introduction

The health of individuals and communities depends on access to quality health care. Expanding access to quality health care is important in order to eliminate health disparities and to increase the quality and years of healthy life. Health care includes not only services received through health care providers but also health information and services received through other venues in the community.

People generally seek help from a health care provider when they perceive their health as compromised. Health care utilisation can be assessed in numerous ways: frequency of visits to a health professional, frequency of hospital admissions, number of medical procedures or prescriptions.

Health care is usually organised as primary, secondary, and tertiary care. Primary care is provided by physicians specifically trained for and skilled in comprehensive first contact and continuing care for persons with any undiagnosed sign, symptom, or health concern which is not limited by problem origin (biological, behavioural, or social), organ system, or diagnosis.

Primary care includes health promotion, disease prevention, health maintenance, counselling, patient education and diagnosis and treatment of acute and chronic illnesses in a variety of health care settings (e.g., office, inpatient, critical care, long-term care, home care, day care, etc.). Primary care is performed and managed by a personal physician often collaborating with other health care professionals, and utilising consultation or referral as appropriate.

Secondary care is a service provided by medical specialists who generally do not have first contact with patients, for example, cardiologists, urologists and dermatologists. In the United Kingdom all patients must first seek primary care and are then referred to secondary and/or tertiary care providers, as needed.

In medicine, tertiary healthcare is specialised consultative care, usually on referral from primary or secondary medical care personnel, by specialists working in a center that has personnel and facilities for special investigation and treatment like cancer care, neurosurgery, or plastic surgery.

2.7.2 Models regarding adults' determinants of health care utilisation

It is commonly thought that symptoms serve to trigger individuals return to health by prompting them to do something about their ill-health. It is also recognised that instead of being presented to health care professionals, many symptoms are ignored, tolerated of self-treated, a phenomenon called the 'symptom iceberg' (Hannay, 1979). However, the presence of symptoms and their severity are not the only determinants of the uptake of health care services, other factors also play a key role in help-seeking behaviour. Various factors are associated with health care utilisation and different

models have been developed in order to explain this. The models range from those which explain individual and social characteristics to those concerned with financial factors and those which combine both.

Social models

Social models range from those concerned only with individual characteristics e.g. the attitudes and beliefs of individuals and their perceptions about health care (Health Belief Model, Rosenstock, 1974) to those which are concerned with events which trigger consultation (Zola, 1973) and yet others which incorporate both social and individual factors (Aday & Andersen, 1975).

Consultation triggers model

Zola (1973) has looked at the timing of decisions to seek medical care. He found that most people tolerated their symptoms for a long period of time before going to see a doctor and that the symptoms themselves were not sufficient to precipitate a consultation. He identified five types of triggers:

-the occurrence of an interpersonal crisis (divorce, death);

-perceived interference with social or personal problems;

-'sanctioning' (pressure from others to see a doctor);

-perceived interference with vocational or physical activity;

-'temporalizing the symptoms' (I will go tomorrow to see the doctor if I feel the same).

This model has been able to explain only some of the reasons for people's health care-seeking behaviour, and it is based on psychological theories that have been disputed, due to their lack of important contextual and sociological aspects (Calnan, 1987).

Social cognition theories attempt to explain the relationship between social cognitions (e.g. beliefs, attitudes, goals, etc.) and behaviour. A model that has been proposed to explain help-seeking behaviour based on the social cognition theories is the Health Belief Model (Rosenstock, 1966).

The Health Belief Model

The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviours. This is done by focusing on the attitudes and beliefs of individuals.

According to the HBM the decision to consult a health care practitioner is determined by the presence of cues, and the balance between costs and benefits, as modified by specific belief in threat from, or vulnerability to, specific conditions. The original HBM (Rosenstock, 1974), is based on four constructs: perceived susceptibility (an individual's assessment of their risk of getting the condition), perceived severity (an individual's assessment of the seriousness of the condition, and its potential consequences), perceived barriers (an individual's assessment of the influences that facilitate or discourage adoption of the promoted behavior), and perceived benefits (an individual's assessment of the positive consequences of adopting the behavior).

Two constructs were later added: perceived efficacy (an individual's self-assessment of ability to successfully adopt the desired behavior), and cues to action (external influences promoting the desired behavior) (Glanz, Rimer, & Lewis, 2002).

Overall the HBM represents an attempt to bring together different factors-from demographic to the psychological-that influence and individual's assessment of the costs and benefits involved in seeking health.

The most comprehensive social model is the socio-behavioural model developed by Aday & Andersen (1975).

The socio-behavioural model developed by Aday & Andersen

This model seems to explain better the framework of this thesis, and therefore a more detailed presentation will follow.

The model states that access to care is a function of the characteristics of the delivery system or the individual(s) in question. Indices that reflect characteristics of the system (e.g. availability of health care providers and facilities) and characteristics of the individual (e.g. age, sex, family income) can be considered to reflect probable or potential levels of access to health care (Andersen et al, 1983). Secondly, the model states that access to care is best evaluated by outcome indicators of the rate or quality of passage through the system, such as utilisation rates or satisfaction scores. Andersen and colleagues (1983) stated that utilisation rates and satisfaction indicators can be considered to represent an individual's actual or realized access to services.

While an individual's rates of utilisation or subjective descriptions of the care obtained represent the realization of entry into the health care system, an individual's potential entry is reflected by three types of categories: predisposing, enabling and need determinants.

1. Predisposing factors

Predisposing factors refer to the socio-cultural characteristics of individuals that exist prior to their illnesses and describe the propensity of individuals to use

services. They are mainly represented by demographic factors like age and gender, by social structure factors like education, occupation, ethnicity, social networks, social interactions, and culture, and by health beliefs like attitudes, values, and knowledge that people have concerning and towards the health care system.

2. Enabling factors

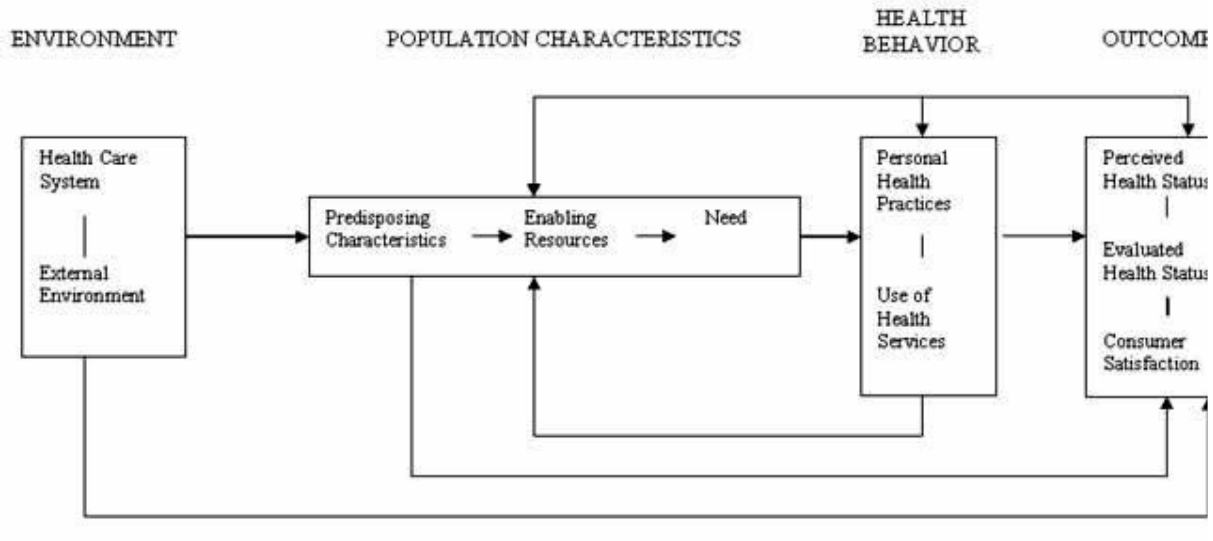
Enabling factors refer to the logistical aspects of obtaining care. They are represented by personal/family factors: the means and knowledge of how to access health services, income, health insurance, a regular source of care, transport, the extent and quality of social relationships; by community factors: available health personnel and facilities, and waiting time; and by possible additions: genetic factors and psychological characteristics.

3. Need factors

Need factors are represented by the most immediate causes of health service use. They are represented by perceived and evaluated need factors: perceived need helps to understand care-seeking and adherence to a medical regimen, while evaluated need is more closely related to the kind and amount of treatment that will be provided after a patient has presented to a medical care provider (Andersen, 1995).

The framework has been through different changes since 1970s and has four phases currently in regards to environment, population characteristics, health behaviours and health outcomes (Figure 2.2).

Figure 2.2 Updated framework regarding health care services utilisation (Andersen, 1995)



Utilisation of health services may be categorized in terms of the type, site, purpose or time interval of use (Aday & Andersen, 1975). The type of utilisation refers to what kind of health provider was accessed. For example, patients may be seen by a physician, nurse practitioner, and physician assistant as well as by a dentist or psychiatrist.

To evaluate appropriate use of care, data are needed on where individuals have their health care needs met. The site of health care refers to the place where care was received: doctor's office, ambulatory care clinic attached to a hospital, urgent care clinic, nurse-managed clinic, hospital emergency room, etc.

The purpose of a visit refers to whether it was for preventive or illness-related care (Aday & Andersen, 1975). Preventive care includes those visits, such as immunizations, which aim to stop illness from occurring. Visits to the health care provider may also be for the purposes of ‘curative’ or ‘stabilizing’ treatments (Aday & Andersen, 1975). Curative care or acute illness visits refer to the process of treatment (e.g. prescription of antibiotics for otitis media) which returns an individual

to his/her previous state of functioning. Stabilizing care or chronic illness visits (e.g. asthma treatments or blood glucose check for diabetic patient) refer to those visits made to a health care provider to continue an individual's state of present functioning. Studies done in the past have examined both the rate of preventive visits and acute care visits (Horwitz et al, 1985; Tessler & Mechanic, 1978).

The time interval for a visit can be expressed in terms of contact, volume, or continuity (Aday & Andersen, 1975). As a measure of achievement in gaining entry into the health care system, contact refers to whether or not the person entered the medical care system in a given period of time.

Volume refers to the number of contacts and revisits in a given time interval, and tends to be nondiscretionary and largely influenced by the provider's decisions to schedule subsequent visits (Guendelman & Schwalbe, 1986).

Andersen's model has been extensively used, predominantly in the North American context, to explain utilisation, albeit with limited success. Explanations for its limited explanatory power include: recall bias due to self-reported utilisation; limitations of survey data as regards the type of services sought and/or received; and insufficient attention given to the purpose of the visit, site of delivery, and to provider-related variables (Mechanic, 1979; Kronenfeld, 1980). These issues have been acknowledged by Andersen in a review of his model (Andersen, 1995).

Financial models

In modern societies governments have become more committed to making health care services available to their citizens. In different countries different changes are continuously introduced to contain costs and enable health-care resources to be used more efficiently. However, fundamental questions

remain in regards to how effective are health services are and how efficient they are in delivering health care.

The terms ‘public’ and ‘private’ are often used as descriptors for health-care systems. In general, ‘public’ refers to government involvement, while ‘private’ may refer to involvement by businesses, charitable organizations or individuals.

Family income and type of insurance are examples of financial predictors which have been found to be significantly associated with the type of provider (private versus public). Lewin-Epstein (1991), who studied three ethnic groups (African Americans, Hispanics, and Whites) in Chicago, found that people who had public insurance or no insurance coverage were more likely to use a hospital as a regular source of care rather than a private physician.

As Halfon and his colleagues have shown (1995), economically disadvantaged families living in the United States, who do not have a health plan, may be disinclined to seek and utilise health services due to other severe and complex social problems associated with poverty. Many families living at or below the poverty line must deal with other environmental and access barriers such as transportation difficulties and safety concerns.

2.7.3 Models regarding children’s determinants of health care utilisation

There is also an extensive literature looking at children’s health care use or families similarities regarding the use of health care services. Parents serve as role models for the next generation of health care users as well as initiate a child's use of health care. Children are not small adults; they have special health needs related to their developmental status. Children require health care that emphasizes

preventive services such as immunizations and continuous monitoring of physical and psychosocial growth and development.

The study of children's health care use is interesting because children depend upon their carers, usually parents, to seek, consent to, and pay for health care.

In general one in eight children is usually classified as a high user (falling in the top one third on a distribution of use), while similar numbers of children are classified as low users (falling in the bottom one third on a distribution of use; Starfield et al, 1979, 1985). Longitudinal research has shown that these patterns of use among children are relatively stable and consistent across time (Starfield et al, 1979). A study by Cardol and colleagues (2006) considered whether family similarity in contact frequency with general practice can be explained as a result of shared circumstances, through socialisation, or through homogeneity of background characteristics. Overall, the study showed that resemblances in contact frequencies within families can be best explained by spending more time together (socialisation), and parents and children consulting a general practitioner simultaneously (circumstances of the moment).

Socio-financial models

Family income, type of insurance, or maternal utilisation, other variables like parental education, ethnicity, and age/gender of the child are examples of financial and socio-demographic predictors which have been found to be significantly associated with the type of provider (private versus public) used as well as the frequency of visits.

The socio-behavioural model developed by Aday & Andersen

The use of the Aday & Andersen (1975) model in the paediatric population remains limited, since it was originally conceived with an adult population in mind. However, it is possible to categorise factors associated with child health care utilisation into predisposing, enabling and need determinants.

1. Predisposing factors

a) Parental education

Regarding parental education, parents who have higher levels of education tend to have children who are seen more frequently by health care providers (Guendelman & Schwalbe, 1986; Newacheck, 1992). It is hypothesised that the relationship between parental education attainment and their child's health care use could be due to a higher income, better access to health care, and so a more comprehensive diagnosis and treatment plan, an increased awareness of the child's health problems, seeking care earlier in a child's illness episode and more appropriately (general practitioner versus emergency room), and seeking more preventive care (Starfield & Budetti, 1985).

b) Age, gender, and ethnicity

The age, gender and ethnicity of the child have been shown to be associated with a child's use of health care. Higher use tends to be associated with younger children, and decreases as childhood progresses (Newacheck, 1992). This may be due to the increased number of scheduled preventive visits for young children, parental inexperience, or a parent's perception of greater child vulnerability at early ages.

In addition, boys have been found to use more care; Starfield and Budetti (1985) reported that boys have had increasingly higher rates of activity limitation than girls. This is maybe correlated with the fact that boys have higher morbidity and mortality rates in all age groups throughout infancy and childhood due to risky behaviour and the fact they are more active and harder to control. For example, ratios for mortality rates among boys versus girls between the ages of two to five include: ages one through four, 1.32:1 and ages five to 14, 1.72:1 (Starfield & Budetti, 1985).

White children are more likely to use health care services than any other ethnic group. Newacheck (1992) found that White children were twice as likely to be high users compared with Black children, probably due to the lower rates of health insurance among Black families.

c) Family structure and functioning

Characteristics of family structure influence a child's use of health care. There is evidence that children from large families or who have mothers working outside the home use less health care (Newacheck, 1992; Newacheck & Halfon, 1986; Wolfe, 1980).

Children who live in single-parent families may be in an environment of increased family stress, increased social disruption and less parental supervision. Thus, these children may face an increased risk of physical injury (Starfield & Budetti, 1985) and tend to have more physician visits than other children when other factors including need, insurance status, and other demographic characteristics are held constant (Halfon et al, 1995).

Therefore, when examining use of health care by children, assessing both the numbers of adults and children within a family is important. It may be that family

structure serves as a proxy measure for other enabling factors such as time to appointment, waiting time, and convenience of services.

Life events such as divorce, illness or death of a parent, can also disturb the family balance and subsequently generate more contacts with general practice, and also a poor living environment can partly explain why some families present more illnesses than others (Dowrick, 1992; Litman, 1974).

The influence of family functioning on pediatric health care utilisation has been investigated in some studies. Two retrospective analyses (Riley et al, 1993; Weimer, Hatcher, & Gould, 1983) found that greater levels of family conflict, as measured by the Family Environment Scale, predicted greater child health care utilisation.

Family functioning also appears to indirectly affect utilisation through its impact on other variables. Black and Jodorkovsky (1994) found that greater levels of family support reduced the influence of parenting stress and contributed to lower utilisation of pediatric services relative to families with lower self ratings of support and high parenting stress.

In 1996 Ward and Pratt used a prospective cohort study to examine the influence of psychosocial factors on the use of general practitioners over a six-month period by 271 children (aged four to nine years) and their mothers. They hypothesised that if parents had a propensity to use health care and viewed it as a valued alternative for assistance, then parental stress played a role in increasing paediatric utilisation. The authors also thought that while parents were able to cope with a problematic parent–child relationship when their stress was low, increased stress decreased their ability to cope without professional assistance (Ward & Pratt, 1996).

2. Enabling factors

a) Financial factors

Availability of insurance coverage increases children's use of ambulatory health care, especially parent's use of preventive health care for their child (Riley et al, 1993). Children with health insurance coverage were approximately 50 percent more likely than children without coverage to be higher users of physician services (Newacheck, 1992). A study completed in Ontario, Canada, found no relationship between children's health care use and socioeconomic variables such as income below the poverty level or the receipt of social assistance (Woodward et al, 1988). The researchers reported that this finding might suggest the universal insurance provided by the Ontario Health Insurance Plan has been effective in removing financial barriers to ambulatory medical care.

The total family income also shows a strong association with the number of visits made to a health care provider. Children living in poverty generally are under-immunized, experience delayed entry to care (Halfon et al, 1995), and are less likely to see a provider over a one year period (Wolfe, 1980).

In a study that analyzed approximately 30,000 children, maternal, and child ambulatory utilisation patterns from the 1978 National Health Interview Survey (NHIS), family income was found to be a significant predictor of utilisation (Newacheck & Halfon, 1986). Using data from the 1976-1978 NHIS, Muller found that those in the lowest income group had 47% fewer visits than those in the highest group (Muller, 1986). In another study which used the 1988 NHIS, children who lived below the poverty line were more likely to be low users (no physician contacts during past year) of health care (Newacheck, 1992).

Given these findings and results of the study conducted by Woodward and colleagues (1988) in Canada, it appears that the effect of family income on children's health care use is moderated by the presence of a health care plan. However, economically disadvantaged families, who do not have a health plan, may be disinclined to seek and utilise health services due to other severe and complex social problems associated with poverty (Halfon et al, 1995). Many families living at or below the poverty line must deal with other environmental and access barriers such as transportation difficulties and safety concerns.

3. Need factors

a) Children's health status

Children who experience more health problems are more likely to be high users of health services (Newacheck & Halfon, 1986; Riley et al, 1993; Starfield et al, 1985). In regards to children's health, both the presence of chronic health conditions (Hankin et al, 1984; Wolfe, 1980) and parental perceptions of poor child health (Newacheck & Halfon, 1986) are related to greater frequency of utilisation.

Recently, children's mental health also has received a lot of attention and the use of psychiatric services (Hankin et al, 1984; Starfield et al, 1985), the use of child mental health treatment (Kelleher & Starfield, 1990), and the use of counselling services (Riley et al, 1993), have all been found to predict a high volume of total health care visits. However, these findings could not be generalised, as other studies failed to find a relationship between mental health and health care use (Ward & Pratt, 1996).

b) Maternal use of health care services

A strong parental predictor of children's health care utilisation is the maternal use of health care services, with greater maternal use of health care services consistently linked to greater use of health care services by children. This relationship has been found with utilisation categorised as the total volume of use

(Starfield et al, 1985) and as use versus nonuse of services (Newacheck & Halfon, 1986; Wolfe, 1980). The findings are consistent with research presented earlier (Cardol et al, 2006) that has shown that levels of health care use cluster in families.

2.7.4 Discussion

Common sense would suggest that people who seek medical help have more severe symptoms than those who do not seek help. However, as previously presented, people's interpretation of their symptoms and their help-seeking behaviour is determined by many factors aside from physiological activity and symptom severity.

The utilisation of health care is a clearly defined concept in the literature; it is an outcome indicator by which realized access can be evaluated (Aday & Andersen, 1975).

Studying an outcome such as utilisation can provide the basis for policy decisions regarding future funding, effectiveness and appropriateness of resources, and the organization of health care.

This section presented different socio-behavioural and psychological models regarding health care utilisation in adults or children. The models can explain variations in help seeking behaviour, but they describe how help seeking

behaviour decisions should be made in theory, rather than how they actually are made in practice.

According to the Aday & Andersen model, researchers have examined the effects of many different variables on adults or children's health care use. This is a double-edged sword since others wanting to conduct utilisation studies have evaluated which variables to use, but few have consistently discussed the strong predictive power of utilisation. Without model replication, researchers wanting to study utilisation of health care must take into account many variables since it is not yet clear which variables account for a large amount of variation. Although Andersen's model has been criticised because it does not emphasise the mediating effects of factors such as psychological distress, locus of control and social support (Arling, 1985), it continues to be relevant in providing a useful analytic framework and starting point for the discussion of the utilisation of health care (Andersen, 1995; Newbold, Eyles, & Birch, 1995).

Previous research regarding adults' and children's health care utilisation has been limited by its methodology and its scope. Few studies have used a population-based sample (Thompson, Aria, Basile & Desai, 2002; Sachs-Ericsson, Blazer, Plant & Arnow, 2005). This is important because clinically based samples are more prone to selection biases that may give inaccurate estimates and these samples are not representative of the population as a whole.

Regarding children's health care use, studies done in the past have shown that the child's age and health status have consistently predicted high use of health care. In all of the studies, there was higher utilisation of care if the child was young in age (Newacheck, 1992; Wolfe, 1980; Woodward et al,

1988). In addition, the more diagnoses or illnesses a child had, the more the child visited a doctor. However, age and health status of a child cannot solely account for high utilisation rates. Other studies have shown the influence of one or more of the following variables: mother's patterns of use, parental education, family structure, and family functioning on the utilisation of children's health care (Newacheck, 1992; Newacheck & Halfon, 1986; Riley et al, 1993; Starfield et al, 1985; Wolfe, 1980; Woodward et al, 1988). Further, the existing studies have a set of variables which can explain a maximum of 33% of the variation in use (Riley et al, 1993). The amount of variation that remains unexplained (67%) suggests that there are other variables, such as aspect of parental behaviour and family functioning which may warrant further study.

Without adequate commitment to the well-being of the child from his/her family, a child is at a higher risk for poor social (i.e. ability to develop and maintain social relationships) and emotional health outcomes (Schor, 1995).

None of the past studies incorporated parenting attitudes as a variable in their utilisation studies. Parental attitudes can be thought of as filters that indirectly affect parental behaviour and thereby reflect the child's environment (Holden & Edwards, 1989). It is the parental behaviour which plays a major role in children's health as well as their use of health care. However, it is not known how much parent/family factors contribute to the variation in children's health care utilisation rates. The relationship between parent/family factors and a child's use of health care is hypothesized to have some affect over and above sociodemographic/financial factors and a child's health status.

In summary, both in adults and children the need factors represented mainly by health status are associated with health care utilisation, therefore the number of hospital admission or general practitioner visits, outcome variables used later in this thesis, could be considered reasonable proxies for physical health.

Also, there is some evidence among the studies reviewed which suggest an association between poor parenting and later life health problems. The evidence is however less consistent for an association between childhood maltreatment and health care utilisation. Further on, it seems there are still gaps in understanding not necessarily why (as research in developmental psychology and neurobiology offers plausible explanations) but how much the family life, and in particular the quality of parent-child relationship could affect the use of health care in childhood and in later life.

2.8 Conclusions

Later life health seems to be influenced by earlier social, behavioural, and environmental influences, and the underlying biological processes. Biological factors include genetic expression, prenatal influences, as well as biological constraints and possibilities created by perinatal and postnatal events plus prior states of health. Behavioural influences include the child or young person's emotions, beliefs, attitudes and behaviours that affect his or her health outcomes. Environmental influences are wide-ranging and include loving interactions with caregivers, socioeconomic resources in the family and community, peer relationships, etc. While the biology, behaviour, and environmental categories are useful factors for healthy development, it is important to understand that this development is not the product of a single,

isolated influence, but the product of the named factors interaction. This thesis aims to assess the impact of nurture in this interaction. Furthermore, understanding the relationship between adults or children and different factors that influence the type and pattern of health care utilisation is important, since this relationship is often of great interest from a programmatic and policy perspective.

The Aday & Andersen (1975) model assumes that there is a sequential relationship between three sets of determinants on which the use of services depends, namely: (1) the predisposition to use services (predisposing); (2) the ability to obtain services (enabling); and, (3) medical need. The predisposing component relates to demographic, socio-structural, and attitudinal-belief variables, irrespective of the underlying condition. The enabling component includes both family and community resource variables that are required to seek and obtain care. Finally, the need component involves an individual's perception of illness and the limitations that it imposes on daily activity.

2.9 Summary

The first part of this chapter presents the concept of parent-child relationship and health and looks at the relationship between the two of them from a life course epidemiology perspective.

The second part of this chapter provides on overview of different models of adult and child health care utilisation, concentrating on the Aday & Andersen (1975) socio-behavioural model that represents one multidisciplinary attempt to bring together economic, health care-related, socio-cultural, and psychological factors.

The presented models deal with a variety of factors but that none of them offer a deep understanding of the effects of parenting on health care utilisation, so this is why this thesis will address this issue. Furthermore, the fifth chapter of this thesis will be based on secondary data analyses of the Christchurch Health and Development Study (CHDS), New Zealand, and will address in a more detailed way some of the limitations of the previous studies linking the quality of parent-child relationship with health care utilisation in later life.

Chapter 3

Longitudinal Studies linking the Quality of Parent-Child Relationship with Health in Later Life

A Systematic Review

3.1 Background of the Review

3.1.1 Previous review

Chapter 2 set the scene for this thesis showing that parent-child relationships are likely to be important for the health of the future adult, and that there is a large body of work which has gone some way towards describing associations between the two. However, the previous research varies considerably with respect to methodology, and so it is difficult to draw conclusions about the overall effects. One way to disentangle these difficulties is to carry out a systematic review and take methodological differences into account. With respect to parent-child relationships and health, this was originally done by Stewart-Brown and colleagues (Stewart-Brown et al, 2003). That systematic review contained 44 papers regarding 36 studies based on 34 cohorts, and took a broad view on health outcomes, looking at a variety of diseases or symptoms and general health. The exposure variables were often represented by conflict and poor parent-child relationships in general. Based on the research hypothesis, the results were classified into positive (22), partially positive (9), no association (10) and negative association (1). Studies were classified as positive if they supported the hypothesis that good parent-child relationships are associated with better

health outcomes; they were classified as partially positive if the association was present in one group (girls) but not in another (boys), or the relationship was positive in one statistical model but there was evidence of overadjusting in another; the results were classified as showing no relationship if univariate analyses were positive but multivariate analyses were negative and there was no evidence of overadjustment; negative studies were those where the association between parent-child relationships and health outcomes were in the opposite direction to the hypothesis.

Stewart-Brown and her colleagues (2003) found some methodological and quality problems with the evidence base, but overall the results supported the hypothesis, showing that the quality of parent-child relationship is a determinant of health and susceptibility to disease later on in life. Eight studies reported the effects of parenting on general health or symptoms, four studies reported on diseases, six studies reported on injuries, one on asthma, two studies reported on blood pressure/haemodynamic stress, five studies on aspects of growth, height or weight, six studies on timing of puberty, and seven studies on teenage pregnancy, with a few studies reporting on more than one outcome. Stewart-Brown et al (2003) concluded that such studies need to be supported by further longitudinal studies, with better measures of family relationships and physical health at different points in time.

In undertaking this thesis, I was given the opportunity to update the review, overcome some of the previous systematic review limitations and thereby set the scene for the rest of the thesis.

3.1.2 Need for updating the previous review

The previous review is the only published systematic review at the moment in relation to this topic. A requirement to update the previous review was mostly determined by the increasing number of papers, published during the last six years which linked parent-child relationships with health and disease in later life. At a broader level, there is an increasing importance of the life-course approach on health that recognizes the continuum from birth through childhood, adolescence and adulthood. This is one of the three principles that form the basis for planning complementary, efficient and effective interventions to protect the health of children, adolescents and their families, in the newest World Health Organisation document, approved by the 56th World Health Assembly in 2003, regarding children's and adolescents' health and well being: 'Strategic Directions for Improving the Health and Development of Children and Adolescents' (WHO, 2003).

Limitations of the previous systematic review which will be addressed in this updated version are:

1. The limited search that was done only on three databases: MEDLINE, PsychInfo and Sociological Abstracts.
2. There was no hand searching and the researchers did not try to contact the authors of the included studies.
3. The search was restricted to studies published in English.
4. The search did not include a health outcome term.

3.2 Context of the Review

This systematic review will address the later life health impact of the parent-child relationship and will concern only longitudinal studies. Some definitions of the main reference terms used in this review are presented below.

3.2.1 Parent-child relationship

Of the many different relationships people form over the course of the life span, the relationship between parent and child is among the most important. The quality of the parent-child relationship is affected among other things by the parent's age and experience; the stability of the parents' marriage; and the unique characteristics of the child compared with those of the parent. The dimensions of the parent–child relationship include warmth and support, sensitivity and responsiveness, conflict or hostility/rejection, and the method and degree of monitoring and controlling children's behaviour (e.g. coercive versus inductive). These dimensions were mostly defined in observational studies using questionnaire and interview methodologies (Ainsworth, 1978; Baumrind, 1991; Hetherington, Henderson, & Reiss, 1999; Patterson & Bank, 1989).

Child abuse is the negative end of the quality of parent-child relationship. As defined by the Department of Health in 2000, physical abuse refers to causing physical harm to a child e.g. hitting, shaking, suffocating, burning, and scalding. Physical abuse may also occur when a child's carer feigns or deliberately causes ill health to a child they are looking after (Munchausen's syndrome by proxy, http://www.nlm.nih.gov/medlineplus/ency/article/001555.htm).

Emotional abuse is defined as the persistent emotional ill-treatment of a child

resulting in adverse effects on the child's emotional development. Examples include telling children they are worthless, unloved, inadequate, or placing unrealistic expectations /responsibilities on them. Emotional abuse can occur alone but will feature in all other forms of child abuse and neglect.

Neglect refers to the persistent failure to meet the basic physical and psychological needs of a child, for example by not providing adequate food; failing to protect a child from physical danger/harm; failing to access necessary medical care.

Sexual abuse is defined as forcing a child to take part in sexual activity, whether or not the child is aware of what is happening.

3.2.2 Physical health

This review concerns different health outcomes such as health in general, diseases and symptoms and proxy measures for health e.g. health care utilization, specifically, number of hospital admissions and visits to the general practitioner.

In the medical field, health is commonly defined as an organism's ability to efficiently respond to challenges (stressors) and effectively restore and sustain a state of balance, known as 'homeostasis'.

Another widely accepted definition of health is that released by the World Health Organisation that states: 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1998). In more recent years this statement has been modified to include the ability to lead 'a socially and economically productive life' (WHO, 2003). The WHO definition was criticised as it could be argued

that health cannot be defined as state at all, but must be seen as a process of continuous adjustment to the changing demands of living.

3.2.3 The association between parent-child relationships and physical health in later life

Warm and nurturing parenting is a family influence that could have a potential long-lasting effect on mental health, relationships and physical health.

The current systematic review is based on the life course theory that was presented earlier in this thesis (Chapter 2), and that studies the long-term effects on chronic disease risk of physical and social exposures during earlier life.

3.2.4 Longitudinal studies

In a longitudinal study participants are followed over time with continuous or repeated monitoring of risk factors or health outcomes, or both (Gordis, 2000).

Most longitudinal studies examine associations between exposure to known or suspected causes of disease and subsequent morbidity or mortality. In the simplest design a sample or cohort of subjects exposed to a risk factor is identified along with a sample of unexposed controls. The two groups are then followed up prospectively, and the incidence of disease in each is measured. By comparing the incidence rates, attributable and relative risks can be estimated. Allowance can be made for suspected confounding factors either by matching the controls to the exposed subjects so that they have a similar pattern of exposure to the confounder, or by measuring exposure to the confounder in each group and adjusting for any difference in the statistical analysis (Gordis, 2000).

One of the advantages of cohort analysis is that the study design does not require strict random assignment of subjects, which is, in many cases, unethical or improbable. Cohort analysis is a useful technique because it is flexible, and it can be used with either original data or secondary data. In some instances, a cohort analysis can be less expensive than experiments or surveys.

One of the most difficult tasks in cohort studies is to assess whether associations between cohort and dependent variables derived from the studies are of a causal nature or not. Cohort studies are subject to the influence of factors over which the investigators do not have full control, and findings from these studies are more open to threats to validity than those of studies with an experimental research design. Because of the lack of randomization in the cohort design, the two groups may differ in ways other than in the variable under study (Gordis, 2000). It is therefore important that findings from cohort studies are critically analysed before any judgement of causality is made.

The other problem with cohort studies is that they can end up taking a very long time, since the researchers have to wait for the conditions of interest to develop. One approach that can help to counter this problem is to carry out the follow up retrospectively (Gordis, 2000).

3.2.5 Systematic review

A systematic review is a summary of the literature pertaining to a specific field that uses explicit methods to perform a thorough literature search and critical appraisal of individual studies, and that sometimes uses appropriate statistical techniques to combine these valid studies (Gordis, 2000).

3.3 Aims and Objectives of the Current Systematic Review

3.3.1 Aim

The aim of the review was to examine systematically the published longitudinal studies linking the quality of parent-child relationship with physical health in later life.

3.3.2 Objectives

The main objectives of this systematic review were the following ones:

1. To examine systematically the evidence concerning the association between parent-child relationships and health in later life.

2. To discuss the implications of the findings.

3.4 Methods

3.4.1 Data sources

The following databases were searched: CINAHL, Cambridge Scientific Abstracts (including ASSIA, ERIC, Social Services Abstracts, and Sociological Abstracts), MEDLINE, PsycInfo, EMBASE, and Child Data.

3.4.2 Search strategy

Studies published between January 2001 and May 2007 in per-reviewed scientific journals, in English, French, Spanish, Italian, Portuguese, or Russian, and found via electronic searches, were included. The search was conducted in May 2004 and updated in May 2007.

The search terms were broad, so the search had a low specificity. The general structure for the electronic searches included: (a synonym reflecting the quality of parent-child relationship) AND (a synonym for family structure) AND (a synonym reflecting the longitudinal nature of the studies) AND (a

synonym for the health outcome). The search also included MeSH (Medical Subject Headings) terms for Medline and CINAHL (see Table 3.1).

The search terms were developed during a trial search by the previous authors, but for this systematic review the search strategy was broader and included an outcome measure.

For the potentially relevant articles a hand check of the references was performed, in order to double check the electronic search.

Table 3.1 Search terms

Search structure	Synonyms for search terms
Quality of parent-child relationship	abuse or affection or aggression or atmosphere or attachment or attitude or climate or closeness or communication or conflict or criticism or disagreement or discipline or discord or dispute or disruption or dissension or dysfunction or empathy or environment or expectation or functioning or hostility or indifference or love or maltreatment or neglect or nurture or over control or overcritical or overprotection or psychology or punishment or rearing or rejection or relationship or smacking or snatching or spanking or support or violence or trust or unwanted or warmth
Family structure	child or family or father or interparental or maternal or mother or paternal
Study type	cohort or follow up or longitudinal or panel or prospective
Health outcome	asthma or blood pressure or consultations or cancer or cardiovascular disease or death or diabetes or doctor visits or general health or general practitioner visits or growth or health services or height or hospital admissions or hypertension or injuries or morbidity or mortality or musculoskeletal disease or arthritis or obesity or pain or weight or well being

3.4.3 Inclusion criteria

Inclusion criteria were related to the types of studies (quantitative longitudinal studies that measured any aspect of the parent-child relationship at one point in time, and any aspect of physical health and well-being at a later time),

types of participants (studies of particular population groups), types of exposure (studies that measured the quality of parent-child relationship), and outcome variables (studies reporting different symptoms, conditions or diseases, or physiological measurements e.g. blood pressure).

All longitudinal studies were included, disregarding the number of participants, the follow up period or the follow up percentage, and the statistical methodology.

As in the previous review by Stewart-Brown and colleagues (2003), gender specific studies or studies looking to a group of people with certain demographic characteristics (such as poor socio-economic status or a specific ethnic group) were considered for inclusion.

Exposure

All studies measuring different aspects of the parent-child relationship were included. The measurements were collected at different points in time (childhood, retrospectively in adulthood, or using official records of child physical abuse or sexual abuse). Also, studies using a composite measure of the family relationship were included.

The parent-child relationship was expressed by different domains such as parental supervision, physical or emotional neglect, physical abuse or severe physical punishment, or sexual abuse if the perpetrator was a parent. Studies whose results concerning child sexual abuse and adult sexual abuse were presented together were included if some data were presented about child sexual abuse in particular or other types of exposure (e.g. parent physical abuse).

Outcome

The outcome variable referred to different illnesses or diseases such as diabetes or cardiovascular diseases, specific symptoms like asthma or different conditions like obesity, physiological measurements such as blood pressure, and death. The diseases and symptoms are presented above in Table 3.1.

Studies looking at physical well-being or health in general were eligible for inclusion in the review.

3.4.4 Exclusion criteria

The study design was one of the most important aspects for this systematic review, and case-control, cross-sectional, and intervention studies were excluded.

Exclusion criteria were also applied to the exposure measures, and studies of child cognitive development and those measuring only the family structure or the time spent by parents with their children were excluded.

Studies in relation to alcohol, smoking, drug use or studies measuring only the cognitive development or psychological well-being were excluded.

3.4.5 Data management

The initial search was performed between 2004 and January 2005 by three reviewers. All titles and abstracts were reviewed on screen independently by reviewers. The total number of the reviewed titles and abstracts was 12,107. All citations reporting studies which could potentially meet the inclusion criteria went forward to the second round of the selection process, as did any citations where it was not possible to reach a decision about inclusion due to insufficient details in the abstracts or titles. Eighty-five abstracts were

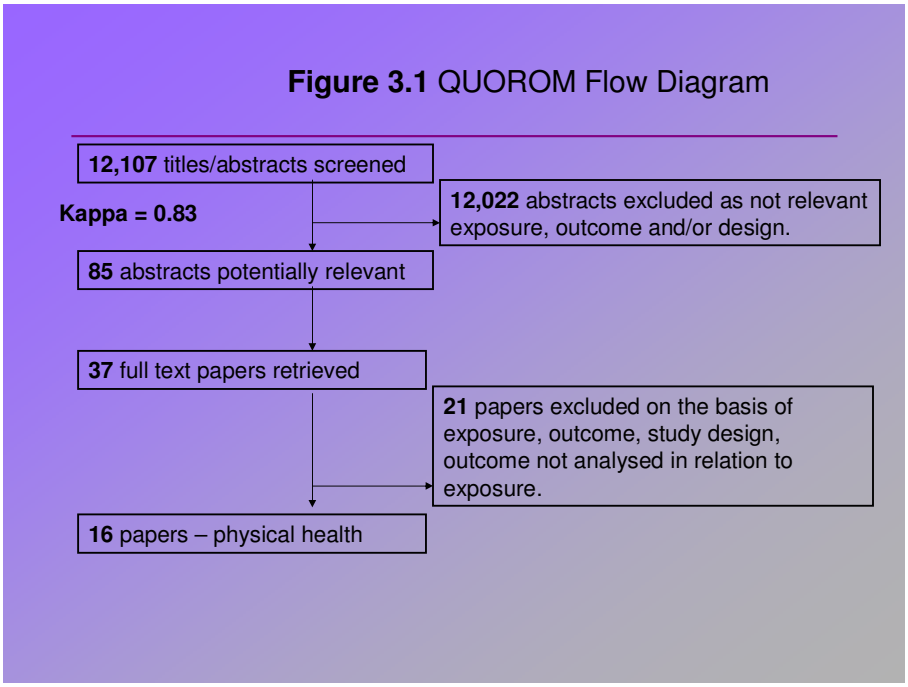
considered potentially relevant and full-text copies of these papers were obtained. Finally, thirty-seven papers were read by two reviewers. Twenty-one papers were excluded on the basis of study design, exposure, outcome, or outcome not analysed in relation to exposure.

There was a good agreement between the reviewers (Kappa coefficient = 0.83), but they maintained a low threshold for potential inclusion and referred all the questions to a third reviewer for independent screening. The selected studies then underwent data extraction. Where studies seemed relevant to the review but where insufficient details were reported, the first authors were contacted for clarification. If new information was made available, the new data were also extracted.

A hand searching was performed on three journals: Child Abuse and Neglect, Child: Care, Health and Development, and Social Science and Medicine. Finally, 16 papers reporting 15 studies were included in the systematic review.

The data management process is presented in Figure 3.1.

Figure 3.1 QUOROM Flow Diagram



3.4.6 Data extraction

For each paper the data was extracted on to a data extraction sheet presented in Appendix 1.

For this review, only the analyses relevant to the subject (analyses that discussed the association between different aspects of the parent-child relationship and health in later life) were included in the data extraction sheets.

One reviewer extracted the data and assessed the methodological quality of the studies. The second reviewer reviewed the data extractions sheets. As before, disagreements between the two reviewers generally were resolved by discussion between themselves, but when agreement was not reached, a third reviewer was involved.

3.4.7 Synthesis of primary studies

The data extraction forms were used to compile summary tables of the data and were the basis for the narrative summary of the primary studies. They

were also used in the construction of the table relating to the methodological quality of execution (Table 3.2).

3.4.8 Narrative analysis

The findings of the primary studies were grouped and differences between studies in relation to samples, exposures, outcomes, quality, and other features mentioned in Tables 3.3-3.7 are discussed in detail.

3.4.9 Investigation of heterogeneity

Differences between studies may relate to study design, geographic location, age of participants, and methods of exposure and outcome assessment. Such differences between studies result in heterogeneity, which may or may not be important (Gordis, 2000). Some heterogeneity can be expected to occur by chance. A distinction is made between statistical heterogeneity (differences in the reported effects), methodological heterogeneity (differences in study design) and clinical heterogeneity (differences between studies in key characteristics of the participants, or outcome measures) (Gordis, 2000). Statistical tests for heterogeneity are used to assess whether the observed variability in study results (measures of effect) is greater than that expected to occur by chance. If there is statistically significant heterogeneity between the estimates derived from different studies, this may result in a decision not to combine the studies in a meta-analysis. Statistical heterogeneity can exist even when all the studies included show an effect in the same direction (e.g. a protective effect), but there is variation in the estimate of the magnitude of the effect (Gordis, 2000).

Meta-regression could be used to investigate and explain sources of heterogeneity among studies. Meta-regression is an exploratory statistical

analytical technique, which investigates the importance and nature of relationships between study results and study characteristics, and can be used to explore sources of heterogeneity (Gordis, 2000).

For this review, heterogeneity analyses were initially considered, but due to the clinical heterogeneity, they were not pursued further.

3.4.10 Publication bias

Publication bias is defined as any tendency on the part of investigators or editors to fail to publish study results on the basis of the direction or strength of the findings (Gordis, 2000).

The data provided by the studies included in this review were not in a suitable format to allow investigation of publication bias using standard procedures (e.g. Funnel plots).

3.4.11 Assessment of study quality

Study quality was judged using a quality score adapted from that developed in order to define the optimal infant growth status (DOH Report. Prevention of adult disease through interventions in early life: a systematic review to define optimal infant growth status, 2004).

The following methodological issues were considered when assessing study quality: sample selection, confounding, and measurement. Study designs are often graded hierarchically according to their quality, or degree to which they are susceptible to bias. The hierarchy indicates which studies should be given most weight in a synthesis. In this review, the degree to which each study dealt with the methodological issues was graded into three levels of evidence: highest quality of evidence, negative risk of bias; evidence of

moderate quality, zero risk of bias; lowest quality of evidence, positive risk of bias (Table 3.2).

The highest quality of evidence or negative risk of bias was attributed to:

1. Prospective longitudinal cohorts, with a good description of the cohort, including good recruitment rates (>70%).
2. Longitudinal studies that had a follow up of more than four years and where more than 90% of the participants were followed up.
3. Studies were most confounding factors were measured and adjusted for in regression analyses or included in path analyses.

The evidence of moderate quality or zero risk of bias was attributed to:

1. Retrospective longitudinal cohorts, with a good description of the cohort.
2. Longitudinal studies that had a follow up of two to four years and where 70-90% of the participants were followed up.
3. Studies were most factors were controlled for in tables, or fewer if one or more were adjusted for in regression analyses.

The lowest quality of evidence or positive risk of bias was attributed to:

1. Studies of other designs, with no or little information on the participants.
2. Studies with less than two years follow up, where the proportion of the followed up cohort was unclear or less than 70%.
3. Studies that controlled for one factor in tables.

Table 3.2 Quality scores criteria

Criteria	Risk of bias-high (-1)	Risk of bias-medium (0)	Risk of bias-low (+1)
1. Appropriate design of the study		Retrospective longitudinal cohort	Prospective longitudinal cohort
2. Adequate description of participants	Little or no information	Adequate description of cohort (sample, demographic factors)	Adequate description of cohort, including acceptable recruitment rate (>70%)
3. Measurement of exposure (parent-child relationship)	Inadequate information on how variables were collected	Adequate information on collection and coding of variables	Detailed description and reliability/validity of suitable measures given
4. Measurement of outcome	Inadequate information on how variables were collected	Adequate information on collection and coding of variables	Detailed description and reliability/validity of suitable measures given
5. Sufficient follow-up length after exposure to assess effects	Under 2 years	2-4 years	More than 4 years
6. Confounding factors	One factor controlled for in tables	Most factors controlled for in tables, or fewer if one or more is adjusted for in regression	Most confounding factors measured and adjusted for in regression or included in path analysis
7. Outcome assessment blind to parent/child relationship status		No details given	Some details of statement given
8. Proportion of cohort followed-up	% not given, unclear or less than 70%	70-90%	More than 90%
9. Information on non-participants: was loss to follow-up sufficient to cause important attrition bias	Very little or no information, or adequate information given but suggest a serious potential for bias	Adequate information given or clear information that suggests a medium potential for bias	Adequate information given, and nothing suggests potential for bias
10. Analysis rigorous and appropriate	No statistical analyses or just descriptive statistics	Tables of means, differences given with statistical test or regression results but without clear/valid measures of association	Regression, path analyses or other techniques with valid measures of association
11. Sample size	Ambiguous, not given, under 100	100-1,000	More than 1,000

3.5 Description of Papers

The information regarding the studies included in the systematic review is presented in Tables 3.3-3.7 and data extraction sheets.

3.6 Results

3.6.1 Identification of studies and selection

In total 16 papers regarding 15 studies were identified. The summary information of the data from included papers is given in Tables 3.3-3.7.

3.6.2 Summary of findings

Size and length of studies

The number of study participants ranged from 165 (Mantymaa et al, 2003) to 18,248 (Surtess et al, 2003) with most papers including less than 1,500 participants. The recruitment rates were reported only in some of the studies and ranged between 27% (Pulkki et al, 2003) to 87% (Sickel et al, 2002), most being over 50%. The follow up length was between 12 months (Lester, Stein, & Bursch, 2003) and 27 years (Juon, Ensminger, & Feehan, 2003), with four studies having longer follow ups of more than ten years (Juon, Ensminger, & Feehan, 2003; Raphael, Spatz Widom, & Lange, 2001; Raskin White & Spatz Widom, 2003; Stewart-Brown, Fletcher, & Wadsworth, 2005). Most studies looked at males and females at different ages in childhood, adolescence or adulthood, and six followed up parent-child pairs (Belsky et al, 2007; Lester, Stein, & Bursch, 2003; Mantymaa et al, 2002; Schwebel et al, 2004; Wyman et al, 2007), or caregiver-child pairs (Soubhi, Raina, & Kohen, 2004).

Demographics

The majority of research was conducted with population studies in the United States. There were two studies conducted in Canada (Kopec & Sayre, 2004; Soubhi, Raina, & Kohen, 2004), three in Finland (Mantymaa et al, 2002; Pulkki et al, 2003; Ravaja, Katainen, & Keltikangas-Jarvinen, 2001), one in New Zealand (Romans et al, 2002), and two in the United Kingdom (Stewart-Brown, Fletcher, & Wadsworth, 2005; Surtess et al, 2003). The study by Sickel et al (2002) included low to middle socioeconomic status women. One study looked at children of parents with HIV/AIDS (Lester, Stein, & Bursch, 2003).

Exposure variables

The exposure variable was expressed by different measures of childhood experience of care and abuse. Some studies used documented cases of child abuse and neglect (Raphael, Spatz Widom, & Lange, 2001; Raskin White & Spatz Widom, 2003) or adolescence (Kopec & Sayre, 2004) and adult retrospective self-reports of childhood abuse (Raphael, Spatz Widom, & Lange, 2001; Romans et al, 2002; Sickel et al, 2002; Surtees et al, 2003). One study used subjective information from caregivers using validated scales such a subscale of the McMaster Family Assessment Device (Soubhi, Raina, & Kohen, 2004). Another study by Mantymaa et al (2002) used the Global Rating Scale for mother-infant interactions based on videotapes taken when children were 8-11 weeks old, and two studies by Belsky et al (2007) and Schwebel et al (2004) were based on objective assessments by home visitors using a validated inventory-the Infant Toddler HOME Inventory, or the Early Childhood version at 36 and 54 months (Belsky et al, 2007). Two

studies measured the hostile maternal child-rearing attitudes based on mothers' reports (Pulkki et al, 2003; Ravaja, Katainen, & Keltikangas-Jarvinen, 2001) and one used both mother's and teacher's reports (Juon, Ensminger, & Feehan, 2003). Another study used self-reported measures of fundamental parental dimensions of care and protection, using a validated instrument-the Parental Bonding Instrument (Lester, Stein, & Bursch, 2003). A study by Wyman et al (2007) used different measures of personal and family stress based on questionnaires completed by parents such as the parental isolation and attachment problem subscales from the Parenting Stress Inventory, and the Adult-Adolescent Parenting Inventory that assesses attitudes associated with child maltreatment (Wyman et al, 2007). The British cohorts (Stewart-Brown, Fletcher, & Wadsworth, 2005) used different exposure variables at each time. In the 1958 cohort, at age 16, cohort members were asked to respond in a self-completion questionnaire to the statements 'I get on well with my mother' and 'I get on well with my father'. In the 1970 cohort, at age 16, cohort members completed an inventory developed for the study modeled on questions in the Parental Bonding Instrument which asked 'which of the following descriptions would you say fits best how you get on with your parent(s)?' Five items described positive aspects of the relationship, and six items described negative aspects (Stewart-Brown, Fletcher, & Wadsworth, 2005).

Outcome variables

Based on health outcomes, the included studies could be grouped into six categories. Two studies used death as the final outcome (Juon, Ensminger, & Feehan, 2003; Raskin White & Spatz Widom, 2003), six looked at different

symptoms and conditions or health in general (Lester, Stein, & Bursch, 2003; Mantymaa et al, 2002; Raphael, Spatz Widom, & Lange, 2001; Romans et al, 2002; Sickel et al, 2002; Stewart-Brown, Fletcher, & Wadsworth, 2005), two at injuries (Schwebel et al, 2004; Soubhi, Raina, & Kohen, 2004), two used insulin resistance syndrome as outcome (Pulkki et al, 2003; Ravaja, Katainen, & Keltikangas-Jarvinen, 2001), one used arthritis (Kopec & Sayre, 2004) and two immunity status (Surtees et al, 2003; Wyman et al, 2007).

Statistical analyses

The statistical analyses were different from study to study. The results were generally presented on the whole sample, but some studies also presented the results separately for boys and girls (Lester, Stein, & Bursch, 2003; Pulkki et al, 2003; Ravaja, Katainen, & Keltikangas-Jarvinen, 2001; Schwebel et al, 2004; Soubhi, Raina, & Kohen, 2004; Stewart-Brown, Fletcher, & Wadsworth, 2005). Most used descriptive statistics, component analyses (correlations), variance analyses (ANCOVA, MANOVA) and regression analyses (linear, logistic or Poisson regression). Some studies were based on path analysis (Lester, Stein, & Bursch, 2003) or structural equation modelling (Ravaja, Katainen, & Keltikangas-Jarvinen, 2001), and one on multivariate analysis using a discrete-time proportional model (Kopec & Sayre, 2004).

This systematic review synthesized only longitudinal studies. Longitudinal analyses introduce the time dimension to ensure that cross-sectional results are not a circumstantial artefact, but rather an outcome consistent with systematic change. In the current review, studies that used path analysis (Lester, Stein, & Bursch, 2003), structural equation modelling (Ravaja,

Katainen, & Keltikangas-Jarvinen, 2001), or the discrete-time proportional model (Kopec & Sayre, 2004), were more likely to take timelines into account.

Most studies adjusted for confounders such as demographic and socio-economic factors (age, gender, ethnicity, education, working status, income, living arrangements, marital status), anthropometric (height, weight), or behavioural factors (alcohol, smoking, exercise), health status at other points in time, or psychological measures of mental health. Some studies did not adjust for any confounders and did not consider any mediators (Mantymaa et al, 2002; Raskin White & Spatz Widom, 2003; Romans et al, 2002; Schwebel et al, 2004).

Studies were classified as positive if they showed an association between the exposure and the outcome variables (even if there was a relationship between e.g. the quality of mother-child relationship and health outcome and not between the quality of father-child relationship and health outcome), partially positive if they showed a relationship only for particular group of participants (in relation to gender, e.g. there was an effect on girls but not on boys), and no association, when they did not show any links between parenting and health in later life.

Study quality

The included studies had quality scores that ranged from 0 (Mantymaa et al, 2002) to 8 (Raphael, Spatz Widom, & Lange, 2001), (limits of -11 to +11, only integer numbers) with the highest scores representing the best / poorest? quality. Studies showing a positive relationship between the quality of parent-child relationship and health in later life had a mean quality score of 3.1; the

study showing a partially positive relationship had a quality score of 6; studies showing no association had a mean quality score of 5.25). However, it was not possible to track a relationship between the scores regarding the quality of studies and the association between exposure and outcome, as there was no consistency.

Studies were more likely to accumulate higher risks of bias (-1) in relation to the follow up length (under two years) (Lester, Stein, & Bursch, 2003; Mantymaa et al, 2002; Soubhi, Raina, & Kohen, 2004; Wyman et al, 2007), adjustment for confounders (non-adjusting or just one factor controlled for in tables) (Mantymaa et al, 2002; Pulkki et al, 2003; Romans et al, 2002; Schwebel et al, 2004), proportion of followed up participants (percentages not given, being unclear or less than 70) (Mantymaa et al, 2002; Pulkki et al, 2003; Soubhi, Raina, & Kohen, 2004; Surtees et al, 2003), and the likelihood of attrition bias (no or very little information, or adequate information provided but suggesting attrition bias) (Kopec & Sayre, 2004; Lester, Stein, & Bursch, 2003; Mantymaa et al, 2002; Pulkki et al, 2003; Ravaja, Katainen, & Keltikangas-Jarvinen, 2001; Schwebel et al, 2004; Soubhi, Raina, & Kohen, 2004; Surtess, 2003).

Results

Two papers showed no relationship between parent-child relationships and health in later life (Juon, Ensminger, & Feehan, 2003; Raskin White & Spatz Widom, 2003), one was partially positive, showing an association just for girls (Ravaja, Katainen, & Keltikangas-Jarvinen, 2001), one showed no relationship overall but with positive results depending on the exposure

variables (Raphael, Spatz-Widom, & Lange, 2001), and twelve showed positive associations.

Based on Table 3.6 and Figures 3.2 and 3.3, it could be noticed that papers supporting the association between parent-child relationship and later life physical health were mostly those on general health which relied on self-reports (Lester, Stein, & Bursch, 2003; Mantymaa et al, 2002; Raphael, Spatz-Widom, & Lange, 2001; Romans et al, 2002; Sickel et al, 2002; Stewart-Brown, Fletcher, & Wadsworth, 2005). The only exception was a paper by Raphael, Spatz-Widom, & Lange (2001) which did not show a relationship between documented cases of child abuse and neglect and pain complaints in young adulthood, but had positive findings when using retrospective self-reports of childhood victimisation.

Positive findings were also reported by studies looking at injuries (Schwebel et al, 2004; Soubhi, Raina, & Kohen, 2004), the insulin resistance syndrome (Pulkki et al, 2003) and immunity (Surtees et al, 2003; Wyman et al, 2007). A study by Ravaja, Katainen, & Keltikangas-Jarvinen (2001) had partially positive results, showing hostile maternal child-rearing attitudes (for girls only) may predict increased levels of the insulin resistance syndrome and its components.

Studies looking at mortality and rare diseases and those relying on official records did not support the hypothesis (mortality: Juon, Ensminger, & Feehan, 2003; Raskin White & Spatz Widom, 2003; arthritis: Kopec & Sayre, 2004). Various studies presented their findings in relation to gender, girls being more likely to somatise in adolescence or in adulthood. Two studies

that looked at injuries found that boys were more likely to be affected by negative parenting.

Figure 3.2 Summary of Results/Exposure

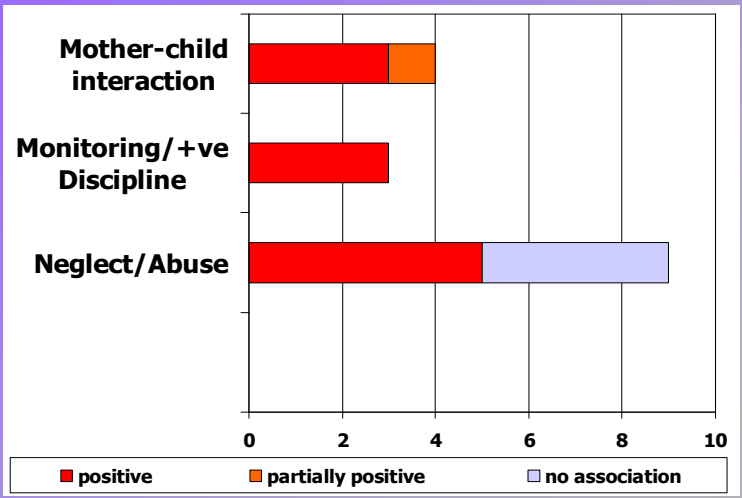
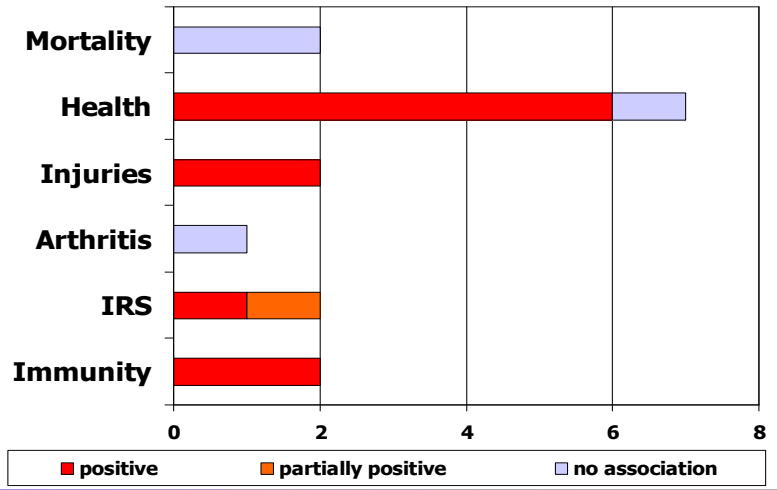
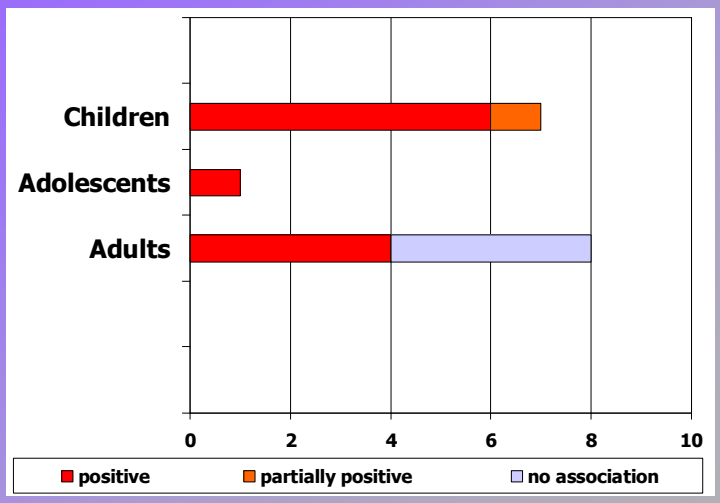


Figure 3.3 Summary of Results/Outcome



Regarding the age at follow up, most studies examining the health status of children reported a positive association with the quality of parent-child relationship earlier in life, while studies based on adults health status, were divided between showing either no or a positive association (Figure 3.4).

Figure 3.4 Summary of Results/Age of Outcome Measure



3.7. Discussion

The aim of the review was to examine, systematically, longitudinal studies published since 2001 in order to examine the relationship between the quality of parent-child relationship with physical health in later life. This was achieved, but some gaps in the evidence were identified and their implications will be assessed in this discussion. Recommendations to address the gaps in the evidence will be put forward and discussed in the final discussion chapter of this thesis.

3.7.1 Previous literature and strengths of the current systematic review

The results of this systematic review can be compared with the previous systematic review by Stewart-Brown and colleagues (2003) in regards to methods and results.

The initial systematic review on the topic included a higher number of studies (36) published from 1960s to 2000 (almost 40 years), compared with the current review that found 16 additional studies published over a period of six years (2001 to 2007). In conclusion the two systematic reviews are not evenly weighted in terms of the amount of research literature available due to the different qualifying periods for each review. However, the evidence suggests that parent-child relationships and health outcomes is a topic which is of increasing interest.

The boundaries of this review were clearly defined. Its focus was to evaluate the longitudinal studies published between 2001 and 2007 and linking the quality of parent-child relationship with health in later life. A wide range of longitudinal studies were included, measuring different outcomes covering all aspects of the physical health of the participants.

Methods

The search strategy and data management were improved for this systematic review. As previously mentioned, the initial systematic review had some methodological limitations in relation to number of databases searched, language of publication and search methods.

For the current systematic review, a total of ten electronic databases were searched, including medical and psychosocial, thereby ensuring that a

diverse selection of data sources was searched from multiple disciplines. Hand searching was also performed on three journals.

Inclusion and exclusion criteria for study designs were pre-specified and decisions about the inclusion or exclusion of studies were made independently by two reviewers. The review included studies looking at different aspects of the parent-child relationship from poor mother-child interaction to monitoring and discipline. Six studies investigated the relationship between retrospective self-reports of child victimisation and documented cases of abuse and neglect and health in later life.

The health outcome terms were broad, looking at health in general and physical well-being, specific diseases, symptoms or physiological measurements (blood pressure), growth (weight and height), as well as death, or health care utilisation (specialist or general practitioner visits, hospital admission).

The search looked at papers published in the most commonly used languages in Europe, Australia and the Americas (English, French, Spanish, Italian, Portuguese, and Russian), but only a few abstracts in Spanish or French were found and excluded because they were not relevant for this systematic review.

The first authors of all studies included in the review were consulted and asked to comment on the accuracy of our data extraction and, where appropriate, to provide missing or additional data. They were also asked to provide the author with any potential missed studies. Prior to conducting the review, the author consulted the project leader and the researcher who undertook the previous systematic review until 2000. These consultations

allowed gauging potential problems with the proposed method of the review and the choice of search terms.

Because of these facts, it could be considered that the methodology quality of the review achieved good standards. However, the review had some inherent limitations which will be presented later.

Results

With regard to health outcomes, studies were classified in a different manner from the original review by Stewart-Brown et al, but the majority of the studies in both reviews looked at general health. The outcomes discussed in the previous systematic review were general health or symptoms, diseases, growth and teenage pregnancy. However, the current review undertaken for this thesis did not include studies looking at the timing of puberty and teenage pregnancy, as these outcomes have been the subject of a different systematic review (Waylen, Robertson and Stewart-Brown, under revision). The initial review also categorised the studies into general health and symptoms of illness, diseases in general and specific diseases, while the current review looked at mortality, health, injuries and specific diseases and conditions like arthritis, insulin resistance syndrome or immunity. However, studies looking at symptoms or health in general showed a positive relationship between parent-child relations and health in later life in both reviews. Less evidence was found in both reviews for studies looking at mortality or specific diseases (arthritis).

A direct comparison between the two reviews could be considered in relations to the two similar outcomes: general health and injuries.

The initial systematic review found that relationships in the home, especially conflict, has a negative impact on children' and teenagers' health in the short term, as the majority of the eight studies had short follow-ups of two to three years. These findings were similar to those reported here which included studies with longer follow-ups (for a maximum of ten to 17 years in the British cohorts-Stewart-Brown, Fletcher, & Wadsworth, 2005).

In studies assessing general health in later life, the initial review looked at the quality of parent-child relationship mainly by assessing different aspects of conflict in the family (in four studies: Holler & Hurrelmann, 1990; Johnston et al, 1987; Mechanic & Hansell, 1989; Sweeting & West, 1995). The other four studies looked at family cohesion or marital satisfaction using validated inventories (Feldman et al, 1997), or at parental support and discipline (Pulkkinen, 1990; Pulkkinen, 1992), or used video-recorded parent-child interactions to estimate rejection and criticism, or praise and support (Gottman et al, 1996; Wickrama et al, 1997; Wickrama et al, 1998).

The majority of the studies looking at health in general in the current systematic review had positive results (six out of seven) and compared with the previous review, used a wider range of validated instruments to assess the quality of parent-child relationship like the Global Rating Scale for mother-infant interactions (Mantymaa et al, 2002), the HOME Inventory (Belsky et al, 2007), or the Parental Bonding Instrument (Lester, Stein, & Bursch, 2003; Stewart-Brown, Fletcher, & Wadsworth, 2005), or abuse assessments (Romans et al, 2002; Sickel et al, 2002).

The results of the two reviews are similar with respect to findings on injuries.

The review by Stewart-Brown and colleagues included six studies, of which two looked at injuries in preschool children, two looked at injuries in school age children and two looked at young adults. The four childhood studies used either validated instruments like the Family Environment Scale and HOME Inventory or new measures completed by both children and parents to describe the quality of parent-child relationship. They also used parental or teenagers self-reports on medical attended injuries or hospital or health centre records.

Three studies reported partially positive or positive results and three studies showed no association. The studies that used validated measures of the parent-child relationship were more likely to report positive results. Also, in general, studies looking at school age children and teenagers found that the quality of the relationship between parent and children was important in preventing injuries, while for younger children other aspects of the home environment and the temperament of the child were more important.

The conclusions regarding the quality of parent-child relationship and the risk of injury in children were replicated in this systematic review. In a study by Schwebel and colleagues (2004) and in another one by Soubhi, Raina & Kohen (2004), specific patterns based on children's age and gender were noticed.

The study by Schwebel (2004) used a validated inventory (HOME Infant/Toddler Inventory) to assess the quality of parent-child relationship, while the study by Soubhi (2004) looked at parenting items measuring the frequency of praise, punishment, rule creation and enforcement, and general interaction with the child. Both studies used parenting reports to assess child

injuries.

Schwebel (2004) reported that boys had significantly more injuries than girls, and children with parents who showed positive parenting were protected from injury. In general, the interaction between children's temperament (at the age of 3 years) and positive parenting was related to reduced injury risk.

Soubhi and colleagues (2004) showed that in children two to three years old significant protective effects were found for girls, positive parenting and percentage of single females in the neighbourhood. Also, in children four to 11 years old a lower risk of injury was found for girls and below-average parenting consistency was linked to a significant risk of injury.

3.7.2 Limitations of the review

Method

There are general difficulties in undertaking systematic reviews of epidemiological studies (Altman, 1999), because some databases report only titles, without abstracts, it is difficult to find unpublished studies and there is a lack of labelling with good key words.

In order to assess the strength of the evidence, the criteria presented in the Methods part of this chapter were used (pp. 69-78). The use of a wide range of search terms decreased the specificity of the search. The use of different terms for longitudinal studies was non-specific as well, leading to the identification and exclusion of different cross-sectional studies that were based on previous longitudinal data.

Publication bias was a potential threat for this review, although given its specific theme, it is (hopefully) unlikely that studies showing a negative

association between poor parent-child relationship and disease in later life (such as neglect predicting good health in adulthood) would not be published. Due to clinical heterogeneity, the author was unable to undertake a quantitative meta-analysis of the results, and therefore it was not possible to give an estimate of the risk attached to poor family relations.

Regarding the exclusion criteria, studies that employed a case-control design, cross-sectional design or intervention studies were excluded. Data collected by such methods can enrich the understanding of interventions efficacy but were beyond the scope of this review because of time constraints.

In relation to exposure, an important limitation is the fact that studies of child cognitive development and studies measuring only the family structure or the time spent by parents with their children were excluded, because a decision made as the aim of the review was specifically to cover the emotional aspect of the parent-child relationship. Similarly, studies where the perpetrators were not the parents were excluded, although some could argue that especially in sexual abuse cases, the fact that it occurred might reflect a lack of parental care for younger children and lack of parental communication for older ones.

Regarding the health outcomes, due to logistical limitations, studies relating to risky behaviour such as alcohol, smoking, drug use, or those relating to mental health or measuring only the cognitive development or psychological well-being were excluded. Also, a similar systematic review using teenage pregnancy as health outcome is being undertaken by others in the department, and the author of this thesis was a second reviewer on the project.

Theoretical Study Frameworks

Many of the studies included in the review had a theoretical framework underlying the design. Although details about the various frameworks were not well presented, in general the conclusions were similar to those reported in the literature that, despite the influence of the environment, the parent-child relationship is an important experiential context for later health and development (Shonkoff & Phillips, 2000; Zeanah & Zeanah, 2001). It is through this relationship that:

-The infant begins, in early life, to understand his world, learns how to interact with others, and begins to develop a sense of his competence and self-worth;

-Later on the child may be exposed to environmental risk factors like poverty, parental mental illness, or partner violence;

-Intrinsic risk factors, such as biological difficulties, are moderated. For example, infants with biological difficulties such as the complications from prematurity have better outcomes when their care giving environments are supportive and more problematic outcomes when their care giving environments are less supportive (Sameroff & Fiese, 2000).

It could also be emphasised that in regards to abuse, the studies considered in this systematic review were generally targeted at children or adults who have retrospectively disclosed abuse. These studies did not adequately address what may be achieved at earlier stages of the abuse trajectory (perhaps the later life effect would have been decreased, if abuse would have been disclosed earlier and stopped, and the child integrated in a supportive environment).

Given the high prevalence rates of childhood abuse, it is crucial to be aware of its long-term effects. Previous research examining the relationship between childhood abuse and adult health outcomes has been limited by methodology and scope. For example, few studies have examined the relationship between childhood abuse and adult health using a population-based sample (Thompson, Aria, Basile & Desai, 2002; Sachs-Ericsson, Blazer, Plant & Arnow, 2005). This is important because clinically based samples are more prone to selection biases that may give inaccurate estimates and these samples are not representative of the population as a whole.

Critical appraisal

A quality score was developed based on that presented in a report regarding optimal infant growth status (DOH Report. Prevention of adult disease through interventions in early life: a systematic review to define optimal infant growth status, 2004). The score was derived from the quality of sample selection, adjustment for confounding, and measurement, which are important factors in generalizing review results. Compared to the previous review, the new quality score contained more categories allowing for more specific critical appraisal. However, as with the previous systematic review, the primary studies varied in terms of the quality of their execution (including sample sizes and follow up), and the quality of data analysis. Sample sizes for some of studies were small, increasing the likelihood of a Type I error. Those studies that achieved higher scores had a good description of the methods, and provided good details about the reliability and validity of different measures they used. However, this was not the case for studies with lower scores, and also studies using non validated measures which were

more difficult to interpret. Studies with good quality scores reported all results, not only those showing a positive association.

In regards to the statistical methodology, most studies adjusted for confounders (socio-economic factors, anthropometric, or behavioural factors, health status at other points in time, or psychological measures or mental health) or used path analysis or structural equation modelling where confounders are adjusted for as part of the model.

In conclusion, most of the studies had positive quality scores, but only three had a quality score of more than seven, limiting the author's ability to make strong recommendations based on their findings.

Generalising from primary studies

A diverse range of longitudinal studies, conducted in a variety of settings (most outside the UK), and reporting a wide assortment of outcome measures were included in this updated systematic review. Inevitably, this heterogeneity made generalisation of findings problematic.

As shown by previous studies, poor parenting clearly has a negative impact on children and can result in behavioural, cognitive, emotional, and developmental difficulties (Kaplan, Pelcovitz & Labruna, 1999; Scannapieco & Connell-Carrick, 2005; Wekerle & Wolfe, 1996). It has also been recognized that these difficulties can extend into adulthood. The long-term consequences of childhood maltreatment on adult mental health has been a major focus of research (Chartier, Walker & Stein, 2001; Fergusson, Horwood & Lynskey 1996; MacMillan, Fleming, Streiner, Lin, Boyle, Jamieson et al., 2001). Wekerle & Wolfe (1996), in their review of child maltreatment, concluded that while many individuals with histories of childhood abuse develop into well-functioning adults, this group has higher rates of

depression, sexual dysfunction, personality disorder, eating disorder, antisocial and abusive behaviour and substance abuse than those with no abuse histories. Furthermore , as shown by Stewart-Brown and colleagues (2003) and supported by the updated results of the current systematic review, an effect of poor parent-child relationships on physical health and disease can also be tracked at different ages. The earlier studies, especially those relating to disease and based on long follow-ups (Russek & Schwartz, 1996; Russek & Schwartz, 1997; Russek & Schwartz, 1998; Thomas, 1976; Thomas et al, 1979) provide the strongest evidence that relationships in childhood are an important determinant of health status in later life. Other studies like the Swedish panel study (Lundberg, 1993; Lundberg, 1997) are also very valuable because they allow the impact of parenting to be compared with that of other widely recognised childhood predictors of adult health, for example, poverty. The previous studies set up the scene for the more recent studies, and it is important to note that the two reviews have similar results, suggesting that relationships in the home may have an important effect on public health and that they are amenable to interventions. Further more, the new review reinforces these results by addressing some of the methodological gaps of the first review.

3.8 Conclusions

Most of the studies included in this updated systematic review, especially the ones on general health relying on self-reports, showed a positive association between poor parenting and health in later life. It was interesting to see there were no studies to contradict the hypothesis that poor parent-child relationships have a detrimental effect on the future adult health and well-

being. However, there were studies showing no association, especially the ones based on documented cases of child abuse and neglect and having as outcome either morbidity, or specific diseases (arthritis).

These studies had different quality scores and the generalizability of the results is difficult given the inconsistency between the quality score and the exposure/outcome association.

The results of the systematic review have identified the following hypotheses to be tested in the secondary analyses:

1. The life course approach linking childhood poor parenting to later life ill health views the state of an individual as a consequence of all his or her lifetime experiences. This is the framework on which this systematic review was conducted. The first hypothesis refers to the nature and strength of the relationship between the quality of parent-child relationship and health care utilisation in later life, which could be inferred from the systematic review studies that looked at parenting and other aspects of health and ill-health.

2. The second hypothesis is in relation to the aspects of the relationships in the home which matter. The greatest number of studies that showed a positive relationship between parenting and later life health were based on assessing neglect and abuse (five). An equal number of studies showed a positive relationship for monitoring versus discipline (three) or mother-child interaction (three).

3. The third hypothesis is that sex differences in health outcomes might be expected as a function of the parent-child relationship: some studies reported findings in relation to gender, girls being more likely to somatise in adolescence or in adulthood. In regards to injuries, two studies found that

boys were more likely to have increased injury rates as a function of negative parenting.

4. The forth hypothesis refers to the factors that could perhaps confound the relationship between the quality of parent-child relationship and health care utilisation in later life (e.g. socioeconomic factors) or play a mediator role (e.g. health risk behaviours or child personality).

3.9 Summary

This chapter presents the results of the systematic review that looks at longitudinal studies published between January 2001 and May 2007 in per-reviewed scientific journals in order to assess the relationship between the quality of parent-child relationship and health in later life.

Fifteen studies of variable quality are included and their findings are discussed in the light of a previous review by Stewart-Brown and colleagues (2003).

The results of the systematic review are used to identify testable hypotheses for the secondary data analyses in Chapter 5 of this thesis.

Table 3.3 Characteristics of the cohorts and measures of parent-child relationships

Paper/Sample/Location	Sample size/Gender/ Exposure age	Length/Percentage of follow up	Exposure/Source/Age
Belsky/Mother/child pairs selected at birth/US	1,041 mother/child pairs/birth	7 years/100%	The Infant–Toddler version of HOME Inventory was used at 6 and 15 months and the Early Childhood version at 36 and 54 months
Juon/African American cohort/US	1,242 men and women/6-7 years old	12-27 years/87.84%	1. Frequency of corporal punishment as a child 2. Family structure Both from teacher's and mother's reports at age 6 and self-reports of the study participants at age 16-17 and 32-34.
Kopec/Population/Canada	9,159 men and women/18 years	4 years/98.4% in 1996/1997 and 96.6% in 1998/1999	Childhood trauma from adolescents' retrospective self-reports
Lester/Children of parents with HIV/AIDS/US	255 parent-child pairs/11-18 years old	12 months/82.7%	Parental Bonding Instrument
Mantymaa/Population/ Finland	165 mothers and babies/infants:8-11 weeks old	2 years/not stated	1. Mothers' interviews (family functioning): 4-10 weeks old 2. Global Rating Scale for Mother-infant interactions which were videotaped:8-11 weeks old
Pulkki/Population/Finland	194 children (85 boys and 109 girls)	3 and 6 years/not stated	Hostile maternal child-rearing attitudes measured when children were 6 years old
Raphael/Population/US	1,196 children/less than 12 years old	20 years/76%	1. Documented child abuse and neglect cases 2. Adult retrospective self-reports of childhood abuse
Raskin White/ Population/US	1,575 children/less than 12 years old	25 years/83%	Documented child abuse and neglect cases
Ravaja/Population/ Finland	523 children/9 years old	3 years/97%	Maternal child-rearing attitudes self-rated when children were 3 years old

Paper/Sample/Location	Sample size/Gender/ Exposure age	Length/Percentage of follow up	Exposure/Source/Age
Romans/Community sample/New Zealand	477 women/less than 65 years old	6 years/74%	Adult retrospective self-reports of childhood sexual abuse and parent physical abuse
Schwebel/Population/US	1,364 children and their families/1 month of age	30 months/76.32%	The Infant/Toddler HOME Inventory when children were 6 months old
Sickel/ Low to middle SES women/US	166 women/6-16 years	7 years/87%	Documented child sexual abuse cases
Soubhi/Population/ Canada	9,796 children and the person most knowledgeable about the child (PMK)/0-11 years old	2 years/not stated	Interviews with PMK-Sub-scales of the McMaster Family Assessment Device
Stewart-Brown/Population/UK	UK birth cohorts: 1958: 16,460 boys and girls/16 years 1970: 16,995 boys and girls/16 years	1958: 17 years/63% 1970: 10 years/38.5%	Interview-based assessments of parent-child relationships: 1958: 16 years old Inventory based on Parental Bonding Instrument: 1970: 16 years old
Surtees/Population/UK	18,248 participants/43-77 years old	44 months/not stated	Interview-based assessment of adverse childhood experience before the age of 17; adults were 43-77 years old
Wyman/Population/US	169 children and their parents/5-10 years old children	18 months/ at visit 2: 93.5% and visit 4: 87%	1. The parental isolation and attachment problem subscales from the Parenting Stress Inventory assessed parent-child relationship stress 2. The Adult-Adolescent Parenting Inventory assessed attitudes associated with child maltreatment

Table 3.4 Results of included papers

Paper	Outcome Measure	Confounders	Results	Quality Score
Belsky	General health	Mediators: 1. Warmth 2. Negativity 3. Positive control	Positive. Unadjusted analysis: Maternal warmth proved to be the more important independent predictor among the three parenting variables that together accounted for 3.1% of the variance. Adjusted analysis: Parenting variables did not prove to be significant predictors of child health independent of SES factors. -Parenting variables were considered mediators in the adjusted analyses. (39.8% of variance explained). -Adjusted for SES and availability of a confidant.	7
Juon	Death-death certificates	Confounders: 1. Gender 2. Childhood behaviour 3. Mental health 4. Frequency of residential moves.	No relationship; there is a risk of early death (32 years old and younger) for persons who have been in foster care; parent-child relationships do not seem to be related with early death. Over-adjusted-Adjusted for SES and child behaviour and mental health.	7
Kopec	Self-reported arthritis or rheumatism diagnosed by a health professional and defined as lasted or expected to last at least 6 months	Confounders: 1. Demographic and socio-economic (age, sex, education, income adequacy, living arrangements, marital status, race, working status) 2. Anthropometric (weight, height) 3. Behavioural (alcohol, smoking, gardening/yard work, exercise/recreation, pattern of daily	No relationship; just two types of trauma, prolonged hospitalization (RR=1.33, 95%CI=1.05-1.68 and being very scared (RR=1.29 with 95% CI=1.02-1.62) showed independent, significant results. Overadjusted-Adjusted for SES and mental health.	2

Paper	Outcome Measure	Confounders	Results	Quality Score
		physical activity) 4. Health status (self-related health, restriction of activity) 5. Psychological measures (depression, mental distress, chronics stress, personal stress, life events) 6. Injury in the past 12 months 7. Hormone replacement therapy		
Lester	Somatic symptoms at baseline and at 12 months were assessed with the average somatisation subscale score of the Brief Symptom Inventory	Path analysis: information on 10 latent and measured variables is given	Positive; adolescents who experienced their parents as highly rejecting reported more somatic symptoms at follow-up ($p<0.001$). Female adolescents reported more somatic symptoms at baseline and 12 months follow-up ($p<0.05$). -Path analysis not including SES factors	3
Mantymaa	Chronic health problems assessed by mothers	No information given	Positive; in multivariate modelling infant's poor interactive behaviour remained in the model as a significant predictor of child's health problems but poor dyadic mother infant interaction was removed from the model. This may be explained by the strong correlation between infant's interactive behaviour and dyadic interaction. It reflects the important role the infant has in mother infant interaction. -Non adjusted.	0
Pulkki	Physiological measurements conducted when children were 3, 6 ,and 9 years old	No information given	Positive. Among boys, low parental SES and strict maternal discipline were independently associated with heightened somatic risk.	1

Paper	Outcome Measure	Confounders	Results	Quality Score
	1. Serum insulin 2. High-density lipoprotein cholesterol (Serum HDL-C) 3.Triglycerides (Serum TG) 4. Systolic blood pressure (SBP) 5. Body mass index		Among girls, the health effect of hostile maternal attitudes depended on the family's SES: in a low-SES family, hostile mothering was associated with heightened somatic risk, while in a high-SES family, hostile mothering was associated with lower somatic risk. Thus, a high-SES environment seemed to protect the girls against the adverse health effects of parental hostility. -Non adjusted.	
Raphael	1. Pain symptom counts 2. Pain problem counts 3. Problem percent 4. Pain illness counts 5.Unexplained pain counts	Confounders: 1. Sex 2. Race (White Non-Hispanic versus Other) 3. Age at the time of follow-up interview 4. Welfare as a child (to control for socioeconomic disadvantages)	1. Prospective results No relationship; across all types of early childhood victimization, and across the different measures of pain complaints, the results revealed no significant relationship between early child abuse and neglect and pain complaints in young adulthood. 2. Retrospective self-reports of childhood victimization After controlling for demographic factors (age, sex, race, and welfare status as a child), logistic regression analyses revealed that self-reported childhood victimization was significantly associated with the report of one or more `unexplained' pain symptoms. The odds of one or more unexplained pain symptom was significantly associated with any self-reported childhood victimization (OR=1.98, 95% CI: 1.50, 2.62, p<0.0001), sexual abuse (OR=2.20, 95% CI: 1.54, 3.15, p<0.0001), physical abuse (OR=2.07, 95% CI: 1.55, 2.77, p<0001) and neglect (OR=2.38, 95% CI: 1.70,	8

Paper	Outcome Measure	Confounders	Results	Quality Score
			3.32, p<0.0001). -Adjusted for SES.	
Raskin White	Death-death certificates	No information given	No relationship. -Non adjusted.	4
Ravaja	Measurements relevant for the IRS were obtained for all participants: 1. Serum insulin 2. Serum HDL-C 3. Serum TG 4. Systolic blood pressure (SBP) 5. Weight (kg) 6. Height (m) 7.Subscapular skinfold thickness (SSF)	Path analysis	Partially positive, for girls. Among boys, the latent construct of difficult temperament may be associated with the development of high levels of physiological CHD risk factors comprising the IRS. Among girls, specific aspects of difficult temperament and hostile maternal child-rearing attitudes may predict increased levels of IRS or its components. -Path analysis, non SES.	6
Romans	Physical illnesses	No information given	Positive. 1. Childhood sexual abuse Participants reporting any CSA were statistically more likely than the non-CSA participants to experience chronic fatigue, asthma and cardiovascular problems (listed as 'heart trouble'). 2. Childhood physical abuse Only chronic pain emerged as significant (chronic fatigue showing a trend at the 10% level). -Non adjusted.	3
Schwebel	Children's injuries	No information given	Positive.	1

Paper	Outcome Measure	Confounders	Results	Quality Score
	requiring professional medical attention reported by parents		Boys had significantly more injuries than girls, and children with parents who showed positive parenting were protected from injury. The interaction between children's temperament and positive parenting was related to reduced injury risk. -Non adjusted.	
Sickel	1. General somatic complaints 2. Specific health complaints 3. Healthcare utilization	Confounders: 1. Age 2. SES 3. Minority status 4. Time since last visit	Positive. Univariate analysis: the abuse group scored significantly higher on GI/GYN (p=0.02) and healthcare utilization (p=0.0006) than did the comparison group when the demographic variables were controlled. Analyses, controlling for the confounding factors, indicate no differences between the three group profiles subgroups on general health problems, vegetative symptoms, colds and flu, GI/GYN, and healthcare utilization factors. However, the MP group scored highest on the GI/GYN factor, significantly higher than the comparison group (p=0.0026), and slightly higher than both the SP (trend, p=0.06) and BF (trend, p=0.08) subgroup. Results also indicate that all three profile subgroups scored higher than the comparison group on healthcare utilization, where SP and BF profile subgroups scored significantly higher than the comparison group (p=0.0079,	6

Paper	Outcome Measure	Confounders	Results	Quality Score
			p=0.0003 respectively), and MP profile subgroup scored slightly higher than the comparison group (trend, p=0.07). -Adjusted for SES.	
Soubhi	Child injuries that occurred during the last 12 months, and required medical attention or contact with health care services	Confounders: 1. Child's age 2. Gender 3. Number of persons in the household 4. Family SES 5. PMK restriction of activity assessing the activity restriction due to chronic illness 6. Depression scores for PMK 7. Child injury's status in cycle 1	Positive. Boys (all ages combined) had a significantly higher probability of being injured in cycle 2: 13.4% versus 9.5%, $p<0.05$. Children 2-3 years old: significant protective effects were found for girls, positive parenting and percentage of single females in the neighbourhood. Children 4-11 years old: A lower risk of injury was found for girls and below-average parenting consistency was linked to a significant risk of injury. -Adjusted for SES+ PMK mental health.	1
Stewart-Brown	Common health problems or diseases	Confounders: 1. Sex 2. Social class 3. Current mental health problems using the psychiatric symptom frequency scale score (a 19 item self-report inventory covering symptoms of depression and anxiety) 4. Relationship with the other parent 5. Social Class	1958 cohort: Both the unadjusted analyses, and those adjusted for social class and sex show an increased odds of reporting three or more health problems age 33 years among those who reported a poor/very poor relationship with their mother. After adjusting for relationship with father the odds ceased to be significantly raised. There was no increased risk in these models for two or fewer health problems	4

Paper	Outcome Measure	Confounders	Results	Quality Score
			or diseases. Results suggest a greater health impact of a poor relationship with father. For those who reported a poor/very poor relationship, the odds of three or more health problems were raised, by 60–80% in all three models, as were the odds of one health problem (40%). Those reporting uncertainty about their relationship with their father also had increased odds of reporting three or more health problems in all three models (40–50%). In a series of analyses, which examined results for men and women separately, the effect was demonstrated to be stronger in women than men. 1970 cohort: The odds of experiencing health problems age 26 years were also raised for those reporting a poor relationship with their parents in the 1970 birth cohort, both in unadjusted analyses and in those adjusted for sex and social class. Additional adjustment for teenage depression attenuated the odds only slightly. In the latter analyses the odds of reporting three or more health problems were raised between 30 and 80% in subjects endorsing five out of the six negative descriptors of the parent–child	

Paper	Outcome Measure	Confounders	Results	Quality Score
			relationship, particularly 'don't understand me/my motives' 'are strict/bossy/have too many rules' and 'treat me like a child'. The first two of these statements were also predictive of one health problem. Positive aspects of the parent–child relationship were not predictive of health problems in any of the analyses. -Adjusted for different confounders in different analyses (including SES and mental health).	
Surtees	1. White blood cell (WBC) counts 2. Leukocyte (granulocyte, lymphocyte, and monocyte) counts	Confounders: 1. Age 2. Sex 3. Age-sex interaction 4. Calendar month of leukocyte assays Mediators: 1. Lifetime depression 2. Education 3. Social class 4. Smoking	Positive, only for lymphocytes. A positive association was observed for lymphocyte counts at both health checks and for the total WBC at the first health check only. No associations were observed for granulocytes and monocytes. -Adjusted for SES.	2
Wyman	1. Rate of total illness 2. Rate of febrile illness 3. The NK cell cytotoxicity	Confounders: 1. Age 2. Sex 3. Race 4. Annual household income per person	Positive. For each one unit increase in stress factor 1 (parent impaired by family stress), children had an increased rate of total illnesses of 11% (p =.05; RR=1.11; 95% CI, 1.00-1.22) and a 36% increased rate of febrile illnesses (p =.001; RR=1.36; 95% CI, 1.13-1.64) in the next year. For each one unit increase in factor 1 (parent impaired by family stress), the natural log of NK cell function at visit 4 increased by 0.15 (p=.004; 95% CI, 0.05-0.26).	3

Paper	Outcome Measure	Confounders	Results	Quality Score
			Sex did not moderate any of these findings. In the longitudinal analysis of NK cell function with stress measures entered separately for each 6-month interval, neither stress factor was significantly associated with NK cell function. -Adjusted for SES.	

Table 3.5 Summary of results for the included papers

Outcome	Follow up Population	Summary of Association
I. Mortality		
1. Juon	Adults	No relationship
2. Raskin White	Adults	No relationship
II. Health in general		
1. Belsky	Children: 6.6 and 7 years	Positive
2. Lester	Children and adolescents: 12-19 years	Positive
3. Mantymaa	Children: 2 years	Positive
4. Raphael	Adults	No relationship; Positive
5. Romans	Adults	Positive
6. Sickel	Adults	Positive
7. Stewart-Brown	Adults	Positive
III. Injuries		
1. Schwebel	Children: 3 years	Positive
2. Soubhi	Children: 2-13 years	Positive
IV. Arthritis		
1. Kopec	Adults	No relationship
V. Insulin Resistance Syndrome		
1. Pulkki	Children: 6 and 9 years	Positive
2. Ravaja	Children: 12 years	Partially positive, for girls
VI. Immunity		
1. Surtees	Adults	Positive
2. Wyman	Children: 6.5-11.5 years	Positive

Table 3.6 Summary of results/exposure for the included papers

Outcome	Exposure	Summary of Association
I. Mortality		
1. Juon	1. Family type 2. Frequency of corporal punishment as a child	No relationship
2. Raskin White	1. Cases of child abuse and neglect, validated and substantiated by a juvenile court or adult criminal court	No relationship
II. Health in general		
1. Belsky	1.The Infant–Toddler version of HOME Inventory 2. The Early Childhood version of HOME Inventory	Positive
2. Lester	1. Parental bonding 2. Child sexual abuse	Positive
3. Mantymaa	1. The Global Rating Scale for Mother Infant Interactions	Positive
4. Raphael	1. Documented child abuse and neglect 2. Retrospective self-reports of child victimisation	No relationship Positive
5. Romans	1. Child sexual abuse 2. Child physical abuse	Positive
6. Sickel	1. Child sexual abuse	Positive
7. Stewart-Brown	1. Interview-based assessments of parent-child relationships: 1958 cohorts 2. Inventory based on Parental Bonding Instrument: 1970 cohort	Positive
III. Injuries		
1. Schwebel	1. HOME Inventory	Positive

Outcome	Exposure	Summary of Association
2. Soubhi	1. Positive parenting 2. Parenting consistency	Positive
IV. Arthritis		
1. Kopec	1. Child abuse	No relationship
V. Insulin Resistance Syndrome		
1. Pulkki	1. Hostile maternal child-rearing attitudes	Positive
2. Ravaja	1. Maternal child-rearing attitudes	Partially positive, for girls
VI. Immunity		
1. Surtees	1. Adverse childhood experiences	Positive
2. Wyman	1. The parental isolation and attachment problem subscales from the Parenting Stress Inventory 2. The Adult-Adolescent Parenting Inventory	Positive

Table 3.7 Quality scores

Paper	1	2	3	4	5	6	7	8	9	10	11	12
Belsky	1	0	1	0	1	1	0	1	0	1	1	7
Juon	1	0	0	1	1	1	0	0	1	1	1	7
Kopec	0	0	0	0	0	0	0	1	-1	1	1	2
Lester	1	1	0	1	-1	1	0	0	-1	1	0	3
Mantymaa	1	0	1	0	-1	-1	1	-1	-1	1	0	0
Pulkki	1	0	1	1	1	-1	0	-1	-1	0	0	1
Raphael	1	0	1	0	1	1	1	0	1	1	1	8
Raskin White	0	0	0	1	1	0	0	0	0	1	1	4
Ravaja	1	1	1	1	0	1	0	1	-1	1	0	6
Romans	0	1	0	0	1	-1	0	0	1	1	0	3
Schwebel	1	0	1	0	0	-1	0	0	-1	0	1	1
Sickel	1	0	0	1	1	1	0	0	1	1	0	6
Soubhi	0	0	1	0	-1	1	0	-1	-1	1	1	1
Stewart-Brown	1	0	0	0	1	1	0	-1	0	1	1	4
Surtees	0	1	0	0	0	1	0	-1	-1	1	1	2
Wyman	1	0	0	0	-1	1	0	0	1	1	0	3

1 = Appropriate design of the study
2 = Adequate description of participants
3 = Measurement of exposure (parent-child relationship)
4 = Measurement of outcome
5 = Sufficient follow up length after exposure to assess effects
6 = Confounding factors
7 = Outcome assessment blind to parent/child relationship status
8 = Proportion of cohort followed up
9 = Information on no-participants: was loss to follow up sufficient to cause important attrition bias
10 = Analysis rigorous and appropriate
11 = Sample size
12 = Total score

Table 3.8 Summary of excluded papers

Paper	Main Exclusion Reason
Amato	Mental health outcomes
Biggs, 2003	Specific group of adults, already affected by a disease
Biggs, 2004	Specific group of adults, already affected by a disease
Batten	Cross-sectional study
Cohen	Specific group of children, already affected by a disease
Dong, 2003	Cross-sectional study
Dong, 2004	Cross-sectional study
Dube	Behaviour as outcome
Flett,	Cross-sectional study
Gessner	Cross-sectional study
Ghisletta	Cross-sectional study
Goodwin, 2003	Cross-sectional study
Goodwin,2004	Cross-sectional study
Imbierowicz	Case-control study
Iwaniec	Intervention programme on a specific group of children
McNutt	Cross-sectional study
Price	Case-control study
Rahman	Review article
Smith	Qualitative study
Stiffman	Case-control study
Van Houdenhove	Cross-sectional study

Chapter 4

Cohort Studies

4.1 Introduction

As shown in Chapter 3, much of the work undertaken in this area has been carried out using data from cohort studies conducted in the United States, United Kingdom, Scandinavia or New Zealand. The benefits of such studies are very important, as they allow complete information on the subject's exposure, including quality control of data, they provide a clear temporal sequence of exposure and disease, and they give an opportunity to study multiple outcomes related to a specific exposure.

For these reasons, I decided to undertake an in-depth analysis of cohort study data. Various studies were considered as described below and in Table 4.1, but for different reasons most of them were discounted for the final analysis.

4.2 Intergenerational Studies

The Intergenerational Studies (IGS) data set was initially seen a valuable resource for this thesis for different reasons, including the richness of exposure and outcome variables and the long follow up of the study members.

The data set is donated for public use and is available at Murray Research Center, Harvard University. Experienced researchers can send a research proposal towards an Expert Committee who could grant approval for the use of the data set on future analyses. This is the process undertook by the

author of this thesis. A more detailed description of the study is provided below because some preliminary analyses were performed on this cohort. The decision of trying to find more information about IGS was initially based on the analysis of a study published by Hightower in 1990 (Hightower, 1990). In this study, the sample size of 174 subjects was compiled from the Guidance Study and the Oakland Growth Study, and good exposure variables that reflected the quality of parent-child relationship were used.

IGS is a three-wave American panel study of the adult participants of the Berkeley Growth Study (BGS), the Berkeley Guidance Study (BG), and the Oakland Growth Study (OGS).

BGS was begun in 1928 and participants were healthy infants born between September, 1928 and May, 1929 in Berkeley, California. BG was begun in 1929, and participants were families with a 21-month old child. OGS was begun in 1932 on a sample of fifth and sixth graders and their families (IGS documentation).

In IGS data were collected from 224 OGS participants, 224 BG participants, and 63 BGS participants. The IGS also collected data from participants' spouses and children. Data collection occurred during 1958-1959 & 1965 (Adult Wave I), 1969-1971 (Adult Wave II), and in 1982 (Adult Wave III) (Table 4.2). The IGS sample consisted of predominantly White Americans of varied SES status (IGS documentation).

Table 4.2 Summary statistic for IGS

OGS	Number/Percentage of Males	Number/Percentage of Females	Total
Subjects	110 (49%)	114 (51%)	224
Subjects' Spouses	51 (50%)	51 (50%)	102
Total	161 (49%)	165 (51%)	326

BG	Number/Percentage of Males	Number/Percentage of Females	Total
Subjects	107 (48%)	117 (52%)	224
Subjects' Spouses	75 (52%)	70 (48%)	145
Total	182 (49%)	187 (51%)	369

BGS	Number/Percentage of Males	Number/Percentage of Females	Total
Subjects	29 (46%)	34 (54%)	63
Subjects' Spouses	27 (57%)	20 (43%)	47
Total	56 (51%)	54 (49%)	110

Adult Wave I obtained a response rate of 66% with respect to the start of each study. At Adult Wave II, 253 participants were successfully retained in

the IGS, 143 from the GS, and 110 from the OGS. Members of the BGS were not included at this time, and the overall response rate was 88% for the former GS, and OGS taken together. At Adult Wave III, 298 participants were successfully included in the IGS, resulting in an overall response rate of 87% of those participating at Adult Wave I.

The target variables were:

1. Exposure variables

Exposure variables were measured when the study members were 13 years old, and they were based on the subjects' assessments of their relationships with their parents (e.g., 'relationships with parents-feels nurtured and secure at home', or 'parental control perceived as reasonable and consistent', or 'parents seen as admirable individuals', or 'parents seen as respected members of the community').

As it is specified on the Guide to the Data Archives at the Institute of Human Development, University of California at Berkeley, the data also included some family environment and parenting variables measured by Honzik Parenting Scale (IGS documentation). In this scale seventeen 7-point items assessed the home environment (e.g., amount of conflict in the home) and 55 items assessed parenting in nine domains such as emotional support, communication, or overprotectiveness.

Parenting was assessed by at least two independent persons at infancy (birth to 23 months), early childhood (2 to 5 years), late childhood (6 to 10 years), early adolescence (11 to 14 years) and late adolescence (15 to 18 years). The scale was used to assess parenting only on the BG and the BGS. However, on the same report it is mentioned that during the 1982 follow up,

members of all of the three studies answered structured interview questions about their parents' supportiveness, discipline, and expectations when they were children and adolescents, and the author was hoping to use those questions in order to assess parenting.

Other exposure variables were considered to be tracked from the interviews of the BG members who at the age of 36 (1965 follow up), provided a set of 60 ratings of their parents' behaviour when they were 10-14 years old.

2. Outcome variables

The information regarding illness and health problems contained in physical examination data was considered very important for this thesis.

The researchers at the Institute of Human Development developed a health rating system of the study members that could be used in future analyses. This is a score on a 5-point scale on which lower numbers reflect better health (IGS documentation).

Other data that could be used included self-assessments of the subjects' health status and functional limitations, the use of tobacco and alcohol, and their subjective ratings of adjustment to aging.

However, this research plan was based on information retrieved from different studies based on the cohort and also from the IGS documentation. Unfortunately, the author did not find the necessary exposure variables in the received data set in order to conduct the proposed analyses. After further communication with Murray Research Center, it seemed that the parenting variables were not included in the public use data set. Dr. Huffine, who was in charge with the data set at the Institute of Human Development, University of California at Berkeley was contacted and she suggested to contact

Professor Cowan, the actual head of the department, as she retired a few years ago. Professor Cowan was contacted several times by e-mail and in writing but he did not respond to the author's messages.

4.3 Columbia County Longitudinal Study

The Columbia County Longitudinal Study, pioneered by Eron, began in 1960 in the United States and has culminated with the collection of four waves of data over a 40-year span on children who were living in Columbia County, New York. The entire population of third graders ('Generation 2' or G2; N = 856; 436 boys, 420 girls) in the county participated in the first wave of this project in 1960 when 85% of the participants mothers and 71% of their fathers were also interviewed ('Generation 1' or G1). Follow up assessments were conducted in 1970 (N = 427) when the participants were approximately 19 years of age; in 1981 (N = 409) when the participants were approximately 30 years of age; and most recently between 1999-2002 (N = 523, or 61% of the original sample) when the participants were approximately 48 years of age (Huesmann et al, 2006).

When the project began, the principal goal was to investigate the child and parental factors related to the development of aggression and other important social behaviours in school-age children (Huesmann et al, 2006).

The considered target variables were:

1. Exposure variables

Parents were interviewed when children were 8 years old in regards to paternal rejection, parental disharmony and parental punishment

2. Outcome variables

After conducting a literature review on the published studies, the author

realized that although some parenting variables and family relationships variables could be tracked, there was no information regarding health outcomes, and most of outcomes were educational and occupational successes and problematic outcomes (e.g., aggression, substance use, and psychopathology) within and across generations. A further collaboration was not considered suitable.

4.4 Precursors Study

Researchers studied 1,337 men in the Johns Hopkins Precursors Study-a study of American male physicians that began in 1948. Men were enrolled in the Precursors Study while they were in medical school between 1948 and 1964. Upon entering the study, each man underwent a complete medical examination and completed questionnaires about personal and family health history, health status, lifestyle behaviours, and reactions to stress. They also completed follow up questionnaires annually until 1995. Medical conditions that were reported on these questionnaires-such as heart disease and heart attack-were verified with medical records and the National Death Index. The average follow up in this study was 36 years (Thomas, 1976). This research was undertaken by Dr. Thomas who started her project with the intent of finding the early indicators of cardiovascular disease. The cardiac patients were generally those who as students had reported more nervousness and depression in the face of tension, more fatigue on awakening, and lower academic standing (Thomas, 1976). Meanwhile, in the cancer investigations, those who developed malignancies in later life reported a less positive relationship with their parents than healthy participants (Thomas, Duszynski, & Shaffer, 1979).

The target variables were:

1. Exposure variables

From the1975, 1978 and 1980 analyses, regarding exposure at recruitment, three subscales derived from a 65-item family attitudes questionnaire were found and they seemed to contain information in regards to closeness to parents, parental dominance and control, and demonstrativity.

2. Outcome variables

From patients records data regarding malign and benign tumours, hypertension and coronary occlusion could be tracked.

Dr. Thomas could not be contacted as she passed away in 1997, but Professor Klag, the current director of the Precursor's Study and Dean of Bloomberg School of Public Health, John Hopkins University, was contacted. Unfortunately, he never responded to the author's e-mails or writing letter.

4.5 British Household Panel Survey

The British Household Panel Survey began in 1991. The wave 1 panel consisted of 5,500 households and 10,300 individuals drawn from 250 areas of Great Britain. Additional samples of 1,500 households in each of Scotland and Wales were added to the main sample in 1999, and in 2001 a sample of 2,000 households was added in Northern Ireland, making the panel suitable for UK-wide research. All members of the household aged 16 or over were interviewed. In addition, children aged 11-15 filled-in a self-completion questionnaire-the Youth Questionnaire introduced in 1994 (Nestar Information). The core questionnaire covered a broad range of social science and policy interests including: household composition, housing conditions, residential mobility, education and training, health and the usage of health

services, labour market behaviour, SES values, income from employment, benefits and pensions. There were also questions regarding the lifetime history of marriage, cohabitation and fertility, lifetime job history, questions on wealth and assets, additional health measures, ageing, retirement and quality of life, neighbourhood and social networks. However, the author could not find the necessary variables that could measure the quality of the parent-child relationship, so in the end the cohort was not found suitable for further analyses.

4.6 1958 British Cohort

The 1958 British Cohort, or the National Child Development Study (NCDS), has recruited a representative sample of children born in the United Kingdom during the week 3-9 March 1958. Data about 17,418 births were collected, and interviews at age 16 and 43 were undertaken (Stewart-Brown, Fletcher, & Wadsworth, 2005).

NCDS has its origins in the Perinatal Mortality Survey. Sponsored by the National Birthday Trust Fund, this was designed to examine the social and obstetric factors associated with stillbirth and death in early infancy among the children born in Great Britain in that one week. Information was gathered from almost 17,500 babies. NCDS was the second in a series of four perinatal studies, the others being based on a week's births in 1946 and 1970, and on births in selected wards in 2000/2001.

The possible variables that would have been included in analyses were:

1. Exposure variables

At age 16, cohort members were asked to self complete questionnaires with statements like ‘I get on well with my mother’ or ‘I get on well with my father’,

and these could be used as exposure variables reflecting the quality of parent-child relationship.

2. Outcome variables

Health variables included assessments of the general health at age 43, and health problems or diseases experienced during the last year.

Similar analyses with the ones considered by the author were undertaken by another group of researcher, so the use of this data set was not seen as appropriate in the end.

4.7 Avon Longitudinal Study of Parents and Children

ALSPAC (The Avon Longitudinal Study of Parents and Children, formerly the Avon Longitudinal Study of Pregnancy and Childhood) was specifically designed to determine ways in which the individual's genotype combines with environmental pressures to influence health and development. At the moment there are data on approximately 10,000 children and their parents, from early pregnancy until the children are aged between 8 and 9 (ALSPAC study). The study started early during pregnancy and collected very detailed data from the mother and her partner before the child was born. This not only provided accurate data on different features like medication, symptoms, diet and lifestyle, attitudes and behaviour, social and environmental features, but was unbiased by parental knowledge of any problems that the child might develop.

The target variables initially considered were:

1. Exposure variables

Data regarding relationship with mother and development of independence at 33 months seemed to be available.

2. Outcome variables

General physical health data was available for children when they were 33 months and 9 years old.

The ALSPAC data set is very comprehensive but the collaboration with the research group at Bristol University was not possible at the time.

4.8 Conclusions

In conclusion, besides CHDS, there were another six cohorts with different pros and cons which the author did not finally pursue for different reasons. However, the New Zealand longitudinal study overcame these restrictions and the analyses will be presented in the following chapters.

4.9 Summary

Chapter 4 presents five cohort studies initially considered for the secondary data analyses, and sets up the scene for Chapter 5 which consists of detailed analyses on the CHDS.

Table 4.1 Summary of studies

Name of the cohort	Size	Age	Exposures	Outcomes	Length of follow up	Percentage of follow up	Confounder	Comments
IGS, US -Oakland Growth Study -Berkeley Guidance Study	a. recruitment: 174 (87 males and 97 females)-white Californian b. outcome: 141 (69 males and 72 females)	a. recruitment: V+VI grade-11 years b. follow up: 50 years	Children interviewed at age 11: a. Relationships with parents-feels nurtured and secure at home b. Relationships with parents-parental control perceived as reasonable and consistent c. Relationships with parents-parents seen as admirable individuals d. Relationships with parents-parents as respected members of the community	a. Psychological health-created using Q Sort Methodology on data recorded at age 50-9 clusters	37 years	83	Not reported	a. Long follow up b. We have a response to our initial letter c. There is a student grant at Harvard-for 5000$ for the use of the data set-dead-line 1st of April d. Data about physical health? e. Could we do mortality rates?
Columbia County Longitudinal Study, US	a. recruitment: 875 boys and girls recruited in 1959-1960 from an entire third grade	a. recruitment: 8 years b. follow up: 19 years	Parents interviewed when children were 8 years old: a. Father rejection b. Mother rejection c. Mother's measure of	a. Depression-depression scale from Minnesota Multiphasic Personality Inventory	19 years	49	Not reported	a. Long follow up b. We do not know if they have data regarding physical health

Name of the cohort	Size	Age	Exposures	Outcomes	Length of follow up	Percentage of follow up	Confounder	Comments
	population residing in Columbia County b. outcome: 427 (211 boys and 216 girls)		parental disharmony d. Father's measure of parental disharmony e. Mother's measure of punishment f. Father's measure of punishment	(MMPI) b. Psychotic tetrad-from MMPI based on the sum of scales 6, 7, 8 and 9				or mortality
Precursors Study, Johns Hopkins, US	a. recruitment: white male students graduating from Johns Hopkins Medical School between 1949 and 1964	a.recruitment:20-30 years? b. follow up: 35-55 in 1975, 40-59 in 1978	1975 and 1978 analyses-Exposures at recruitment: Three subscales derived from a 65 item family attitudes: a. Closeness to parents b. Matriarchical dominance c. Demonstrativity d. Good father to son relationship e. Good son to father relationship f. Poor father to son relationship g. Son to father relationship h. Good mother to son relationship h. Good son to mother relationship i. Good parent to	Outcomes at follow up: a. All malignant tumours b. Group of specific malignant tumours c. Malignant skin cancers d. Benign tumours e. Hypertension f. Coronary occlusion	11-26 years in 1975, 14-29 years in 1978, and 16-31 years in 1980.	80	1975 and 1978 analyses-none considered 1980 analysis a. Year of birth b. Age c. Serum cholesterol level d. Body weight e. Number of years smoked f. Lifetime alcohol consume g. Medical specialty h. Area of residence	a. Long follow up b. Could we do mortality rates? c. Small and specific sample size d. Poor statistical analyses

Name of the cohort	Size	Age	Exposures	Outcomes	Length of follow up	Percentage of follow up	Confounder	Comments
			parent relationship j. Poor mother to son relationship k. Poor son to mother relationship l. Parent to parent relationship 1980 analysis-Exposures at recruitment: a. Closeness to parents b. Good paternal relationship c. Good maternal relationship d. Parental control e. Patriarchal versus matriarchal dominance					
British Household Panel Survey	a. recruitment: 1991-2002 annual survey (11 waves) of each adult member of a nationally Panel Survey representative sample of more than 5000 private households	a. recruitment: adults more than 16 years old Special Survey of 11-15 year old household members from wave 4-605 households	?	a. Physical health? b. Mental health?	?-maximum years-6 Wave 4: 1994-1995:11 years old 1999-2000: 15 years old	?	a. Household ? b. Economic activity? c. Health and health behaviour? d. Children/ Childcare/ Domestic Labour?	a. Good sample size b. Do we have the right information regarding exposure? c. Small length of follow up

Name of the cohort	Size	Age	Exposures	Outcomes	Length of follow up	Percentage of follow up	Confounder	Comments
	in Great Britain=10000 individual interviews Wave 9-two additional samples of 1500 households each from Scotland and Wales were included Wave 11-an additional sample of 2000 households from Northern Ireland was included=Northern Ireland Household Panel Survey	contain eligible children					e. Income/Expenditure/ Economic Expectations?	
British National Birth Cohort Studies:	a. recruitment:-representative sample of	a. recruitment: birth; 16 years	a. Self completion questionnaire with statements like 'I get on well with my mother' etc. –age 16	a. Health in general-age 33	17 years	age 16-69 age 33-72	a. Social class b. Gender	a. The results support the hypothesis that the quality of the parent-child relationship

Name of the cohort	Size	Age	Exposures	Outcomes	Length of follow up	Percentage of follow up	Confounder	Comments
1958-National Child Develop. Study	children born in the UK during the week 3-9th March 1958: 17418 births -11355 interviews at age b. outcome: -11363 interviews at age 3316	b. follow up: 33 years		b. Health problems or diseases experienced in last year-age 33 c. Mental health-Malaise Inventory-age 33			c. Relation with other parent	predicts mental and physical health in later life b. Large number of subjects c. Covers 17 years d. Least sophisticated measure of the quality of relationship
ALSPAC= Avon Longitud. Study of Parents and Children	Mothers of the 14000 children born in Avon, UK during 1991 and 1992	?	a. Neglect-pregnancy, 33 months b. Abuse-pregnancy, 33 months c. Relationship with mother and development of independence-33 months d. Parental and family relations-pregnancy, 33 months	a. General health-pregnancy, 33 months, 9 years b. Different symptoms-pregnancy, 9 years c. Mental health-Edinburgh Postnatal Depression Scale-32 weeks Crown Crisp Experiential Index- 33 months, 9 Months	9 years	?	a. Age b. Social class c. Education d. Ethnicity e. Social support f. Relationship with partner g. Marital status h. Teenage pregnancy i. Leave home before 18 j. Recent events	a. Large number of subjects b. Good study design with a lot of information from a variety of sources including questionnaires completed by parents, education, social and health records etc. c. Financial costs?

Chapter 5

Christchurch Health and Development Study

5.1 Introduction

As previously presented in this thesis, few longitudinal studies have tried to disentangle the association between the quality of parent-child relationship in childhood or adolescence, other environmental factors, and health care use in later life.

Examining health care utilisation in individuals with poor parenting provides a practical perspective on the effects of health problems. Health care use can be assessed in numerous ways: frequency of visits to a health professional, frequency of hospital admissions, number of medical procedures or prescriptions.

The previous literature on the topic is mainly based on cross-sectional research linking abuse with health care use - which limits our understanding of cause and effect.

The only recent longitudinal studies are the ones by Mantymaa et al (2003) and Sickel et al (2002), studies included in this thesis's systematic review.

This chapter is based on secondary data analyses of the CHDS, and will address some of the limitations of the previous longitudinal and cross-sectional studies.

The chapter is structured in six parts: presentation of previous studies linking parenting with health care use, methodology, results (including descriptive analyses, missing data analyses and regression models), discussion, conclusions, and summary.

5.2 Previous Literature linking Parenting with Health Care Use

Family-related social threats (poor parent-child relations, neglect, or abuse) can put a child at risk for delays in physical, social and emotional development in later life. There is some evidence for a reciprocal relationship between poor child outcomes (e.g. internalizing and externalizing behaviours, injury, illness episodes) and parenting (Fox, 1994). George and Bloom (1997) state that parental child-rearing practices are thought to be causally related to major aspects of personality and character structure, to subsequent behaviour problems, and to specific forms of psychopathology in children. Parents' emotions directly influence child-rearing practices, including their children's use of health care. For example, a parent who cannot regulate his/her own emotions, has unrealistic expectations of a child, or uses rewards and punishments inconsistently, tends to have children who are less compliant and take more risks (Dix, 1991). Riley and colleagues (1993) found that child's externalizing behaviours were positively related to use of health care services. Reasons for the increase in use may range from inadequate parenting skills to the inability to regulate parental emotional responses to the child. A parent who consistently displays more warmth has favourable developmental outcomes for children, whereas parental hostility is consistently associated with children who may have behaviour problems or other unfavourable developmental outcomes.

5.2.1 Longitudinal research

The only more recent papers regarding longitudinal studies looking at parent-child relations and health care use in later life are those by Mantymaa et al (2003), and Sickel et al (2002), included in the systematic review in Chapter 3.

Mantymaa and colleagues (2003) studied the quality of early mother-infant interaction on the subsequent health of the child, on 165 pairs of mothers and babies. A significantly larger proportion of the children with chronic health problems had a poor dyadic mother-infant interaction compared with the group with no health problems ($p = .034$). The study had a small sample size and was initially designed as an intervention, but finally the intervention and the control groups were assessed as one.

In a study by Sickel and colleagues (2002), abused females were referred by protective service agencies in Washington DC metropolitan area. The initial assessment (Time 1) sample consisted of a total of 166 participants, and two follow up interviews (Time 2 and 3) were conducted at one-year intervals after the initial assessment; a third follow up (Time 4) was conducted two or three years subsequent to the Time 3 (on average of seven years after the initial assessment). Health outcome data included: doctors visits, hospitalization, major illness and body mass index (BMI). Results showed that for a unit increase in healthcare utilisation there was a 55% chance of being in the abused group (OR=1.546, p=.002). The data reflected the experiences of those females whose abuse was reported and who consented to participate in the research. The sample was not representative for the most extreme cases or the unreported ones.

5.2.2 Cross-sectional research

A variety of studies have used cross-sectional designs to investigate health care utilisation and abuse. While studies have consistently shown associations between childhood abuse and health care use, several methodological limitations have been noted and will be discussed before reviewing the literature. Few studies examining the relationship between childhood abuse and adult health have used population based samples. The majority of these studies are from specialty or primary care clinics which limit the ability to make generalizations regarding the larger population. Samples from these settings may introduce selection bias, where people with more difficulties (more abuse, more health problems) may be more likely to seek help than people with fewer difficulties (Last, 1995).

Most of the studies reviewed have examined childhood sexual abuse in women. Very few have included men or have looked at other types of abuse such as physical or emotional abuse. The relationship between abuse and health may be different between genders and therefore the conclusions cannot be extended to men. Both physical and emotional abuses are prevalent and are just as likely as sexual abuse to be associated with adverse health outcomes (Briere & Runtz, 1989).

Many of the published studies do not control for confounding factors such as age, sex, socioeconomic status and other childhood adversities. The question that arises is: how much does the childhood abuse itself contribute to the poor health status in comparison with the contribution of the disadvantaged childhood environment? (Felitti et al, 1998; Fry, 1993).

Other common methodological limitations in the studies reviewed were small sample sizes, low response rates and non-validated measures of abuse. For example, McCauley et al (1997) based their study on one question about sexual abuse and one question about physical abuse.

The cross-sectional studies examining the relationship between childhood abuse and health care utilisation are summarized below.

In a study by Felitti et al (1991), 22% of respondents with histories of sexual abuse visited their doctor frequently (ten or more times in the preceding year) compared to 6% of the control group when controlled for age and sex. The sample was made up of white, middle-class and working adults and only one question on sexual abuse was asked; therefore the findings from the sample could not be generalized to the general population.

Another study of young undergraduate students (males and females), showed that students with a history of abuse (either sexual or physical) reported more hospital admissions and surgeries (Salmon & Calderbank, 1996). The questionnaire had four questions on sexual abuse and only one question on physical abuse. One question is unlikely to give a reliable and valid measure of physical abuse, so the sample could not be generalized to a larger population.

Hulme (2000) studied a sample of 395 patients in a primary care setting and found that women with a history of childhood sexual abuse visited the primary care clinics 1.33 times more than women with no childhood abuse. Over a two year period, this resulted in costs averaging $150.00 more for women with a history of childhood abuse. The authors found that women with childhood sexual abuse had a lower socioeconomic status, were more likely to use public aid, were less likely to be married and less likely to have children. However, they did not control for these

factors in their analysis. The methods used had a number of limitations and compromised the findings of the study.

Newman and colleagues (2000) studied a sample of 608 women from an HMO in California for somatic symptoms and medical utilisation. Researchers used self-report measures but also used medical records for 136 respondents. Over a 2-year period, women with childhood sexual abuse reported more doctor visits than those with no abuse. The differences were apparent among internal medicine and outpatient surgical clinics, but not significant in ear-nose-throat, emergency room, gynaecology, ophthalmology and psychiatry/psychology visits. The authors found a significant interaction in women who were depressed and had experienced childhood sexual abuse. In the group of people who had been subjected to childhood sexual abuse, respondents who suffered higher levels of depression experienced more emergency room visits and doctors visits than respondents with low levels of depression. These differences between depressed and non-depressed respondents were not found in the group which had not been subjected to childhood sexual abuse.

This study controlled for age, income, marital status and childhood physical abuse. The visits were determined through self-report in a 12-month time frame which is considered acceptable for reliability and validity.

In a Canadian study, women reporting childhood sexual abuse had more surgeries, hospitalisations and visits to family doctors than women in the comparison group (Finestone et al, 2000). The comparison group, consisting of nurses, was unlikely be similar in socioeconomic status or other background characteristics to the group with histories of abuse. They found

no significant differences between women reporting childhood sexual abuse and women with psychiatric illness but no childhood sexual abuse.

There is some evidence that the level of health care utilisation is related to the severity of abuse or the number of types of abuse. Arnow and colleagues (2000) showed, in their study of 218 women from an HMO, an association between high utilisation rates and severity of childhood abuse. Individuals with more severe abuse reported more emergency room visits and (non-psychiatric) outpatient visits. A study's strength is that detailed data was collected on the frequency and time the physical and sexual abuse occurred using the National Population Health Survey questions. They used the HMO's health records to determine utilisation. Unfortunately, they did not control for any confounders.

Moeller and colleagues (1993) suggested that being exposed to many types of abuse (physical, sexual, emotional) increase rates of health care utilisation. In their study of 668 women from a gynaecologic practice, they reported that women subjected to many types of childhood abuse experiences were more likely to report being hospitalised for illnesses and surgeries than women exposed to only one type of abuse. The study was based on a series of self-rated questions about abuse, health and health care utilisation. There were no controls for confounders, and the women in this study were not necessarily representative of the general population. They were predominantly Caucasian, well-educated, middle class and ranging from 16 to 76 years old.

In attempting to explain the link between childhood abuse and health care utilisation, Rosenberg and colleagues (2000) hypothesized that individuals

with histories of abuse may have higher rates of post-traumatic stress disorder (PTSD) which in turn lead to higher health care utilisation rates. Researchers showed increased rates of medical utilisation for individuals with histories of abuse but not for patients with PTSD, a finding that did not support the hypothesis. The sample included 107 men and women from a medical facility. They used the Trauma History Questionnaire to assess physical and sexual abuse, but it was unclear which variables were used as covariates in the regression model.

Unlike most published studies, McCauley and colleagues (1997), in her sample of 1,931 women from primary care clinics, found no association between childhood abuse and higher health care utilisation rates. There were no differences in the number of operations, miscarriages or visits to the emergency department. However, women reporting childhood abuse and abuse as adults experienced more visits to the emergency department in the last six months than women with no abuse histories. This study controlled for sociodemographic characteristics. The main limitation was that a contamination of categories between the abuse and non-abuse groups may have occurred since only two questions were asked.

5.2.3 Differences between existing studies and the present study

The study hypothesis is that the quality of parent-child relationship will predict health care use in young adulthood after adjusting for socioeconomic status, family structure and family conflict. This study will also examine the mediating role of important health risk behaviours, mental health and child personality, in the parenting-health care use relationship.

The main difference between existing studies and the present study is that this is a longitudinal study from a representative rather than clinically based population and that it is based on New Zealand rather than American data. Also, the instruments used in previous studies differed from this study that uses comprehensive instruments with known validity and reliability. In contrast with previous studies, this study will report results separately for males and for females.

5.3 Methodology.

5.3.1 Overview of data analysis plan

According to Rothman and Greenland (1998), a good data analysis has a number of distinct steps. One of the first steps was to understand how variables are distributed and interrelated. The next step was to examine the relationships among the variables by creating contingency tables. Stratification analysis was then conducted considering important factors such as gender and by each of the confounding and potentially mediating variables. Some missing data analyses were also performed, and were followed by univariate and multivariate analyses. Regression coefficients were examined as variables were added to regression models.

Two statistical software packages were used in performing the analyses: SPSS for Windows (versions 13, 14 and 15), and STATA (version 9).

5.3.2 Descriptive statistics

The initial step of the analysis was to gain an understanding of how measures of family functioning, parent-child relationship, demographic characteristics, health risk behaviours, child personality, mental health, and health care utilisation were distributed and interrelated. The distribution of each variable was examined. This process helped in considering violations of assumptions and in

categorizing variables. The relationship between gender and health was studied extensively since health varies by gender.

The associations among variables were examined by creating contingency tables. In epidemiology, most of the pertinent information is in these contingency tables. This determined whether or not certain categories of variables have sufficient cases for analysis. Studying the association between the quality of parent-child relationship and health across strata was useful in understanding and interpreting how this relationship is influenced by the presence or absence of other pertinent factors. Stratification analysis is considered to be an important interim tool by epidemiologists (Rothman & Greenland, 1998). Patterns in the data can be studied in a clearer way by stratifying than by other approaches. It assists in the evaluation and control of confounding and also in the evaluation and description of effect-measure modification.

Summary statistics were used for categorical and continuous variables. The summary statistics for the continuous variables included information regarding the mode, range and upper and lower quartiles because when the data are skewed, these are better summaries to use (Hutton, 1997). For categorical variables the statistics summaries consisted of basic frequencies. In the results presentation, the valid percentages were rounded to the nearest whole number.

Some measurements of the variables used in this dissertation are presented in the Appendix 2.

Confounders

Confounding is the distortion of the association between an exposure and an outcome variable by a third variable associated with both of them. The

distortion introduced by a confounding factor can be large, and it can even change the apparent direction of an effect. However, unlike selection and information bias, it can be adjusted for in the analysis. Each potential confounder has to meet two criteria before being considered confounder. Criterion one is that it must be a known risk factor for the disease, and criterion two is that it must be associated with the main exposure, but not as a result of the exposure. In other words, all potential confounders should be working independently and not as part of the proposed exposure-disease pathway.

Mediators

A variable may be considered a mediator to the extent to which it carries the influence of a given exposure to a given outcome. Generally speaking, mediation can be said to occur when (1) the exposure significantly affects the mediator, (2) the exposure significantly affects the outcome in the absence of the mediator, (3) the mediator has a significant unique effect on the outcome, and (4) the effect of the exposure on the outcome shrinks upon the addition of the mediator to the model.

Perfect mediation holds if the exposure variable has no effect on the outcome variable when controlled for the mediator variable. Since there are many factors affecting health, a more realistic goal in evaluating a mediator, is that the mediator significantly attenuates the relationship (Baron & Kenny, 1986).

5.3.3 Missing data analyses

Missing values were found among several variables. The topic of missing data has gained considerable attention in the last decade. It has become difficult to publish empirical work in medicine without the discussion of how missing

data was handled. Also, more and more methods for dealing with missing data have been presented over the last few years.

Although missing data has received a growing amount of attention, there are still some key misunderstandings regarding the problems that missing data generate, as well as acceptable solutions. Missing data are important to consider, because they may lead to substantial biases in analyses. On the other hand, missing data is often harmless beyond reducing statistical power. There are a number of ways in which we may encounter missing data in medical research, including the following:

1. Individuals not followed up by design;
2. Item nonresponse;
3. Loss due to follow up or attrition;
4. Sample selection (e.g., estimating a model that is only applicable to a subset of the total sample).

Attrition

For the CHDS, attrition was the main mechanism through which we encountered missing data.

Attrition is a problem when participants die or move away and the rate of attrition increases as time passes. Also, loss of respondents in the second or subsequent waves of longitudinal data collection can be selective. This selection bias can reduce the internal or external validity of the research findings (Miller & Wright, 1995; Ribisl, Walton, & Mowbray, 1996). Methodological research of the determinants of attrition makes it possible to identify which categories of subjects are most likely to be lost to follow up in longitudinal studies.

Tabachnick and Fidell (2001) comment that the pattern of attrition is more important than the amount of missing data. Attrition may be associated with certain demographic characteristics of the participants but also with the dependent variable itself (Coen, Patrick, & Shern, 1996).

In general, the most important groups of respondents lost to follow up are those who refuse further participation, those who cannot be located at follow up, and those who become incapacitated by illness or have died. In the United States, the Epidemiologic Follow Up Study of the National Health and Nutrition Examination Survey I (8-year follow up among 2,981 subjects) has found different predictors for the three types of attrition (Farmer, Locke, & Liu, 1994). Multivariate analysis revealed those participants who were depressed, as well as those who were young, single, and smoked tobacco, were less likely to be located for follow up. Educational level was the only factor associated with refusal. Males, elderly people, single people, the unemployed, people with high blood pressure, and smokers were more likely to die during the follow up interval.

In CHDS the proportions of missing values on some individual variables were high, and possible reasons and how they affected the analyses will be discussed later in this chapter.

5.3.4 Regression models

According to Kelsey et al (1996), regression is the method of choice for analyzing multiple variables. Different univariate and multivariate regression models were constructed, using linear regression, logistic regression, ordinal regression, and Poisson regression methods. However, the main analyses presented in this thesis are based on logistic and Poisson regression methods.

Linear regression and correlations

A valuable numerical measure of association between two variables is the correlation coefficient, which is a value between -1 and 1 indicating the strength of association of the observed data for the two variables (Altman, 1999).

Although a correlation coefficient usually indicates the strength of a linear relationship between two variables, its value alone may not be sufficient to evaluate this relationship, especially in the case where the assumption of normality is incorrect.

Pearson's correlation coefficient is a parametric statistical tool, and it may be less useful if the underlying assumption of normality is not respected. Non-parametric correlation methods, such as Spearman's ρ is useful when distributions are not normal.

Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an exposure variable, and the other is considered to be an outcome variable (Altman, 1999).

Before attempting to fit a linear model to observed data, one should first determine whether or not there is a relationship between the variables of interest. This does not necessarily imply that one variable causes the other but that there is some significant association between the two variables. A scatterplot can be a helpful tool in determining the strength of the relationship between two variables. If there appears to be no association between the proposed exposure and outcome variables (e.g., the scatterplot does not

indicate any increasing or decreasing trends), then fitting a linear regression model to the data probably will not provide a useful model.

A linear regression line has an equation of the form:

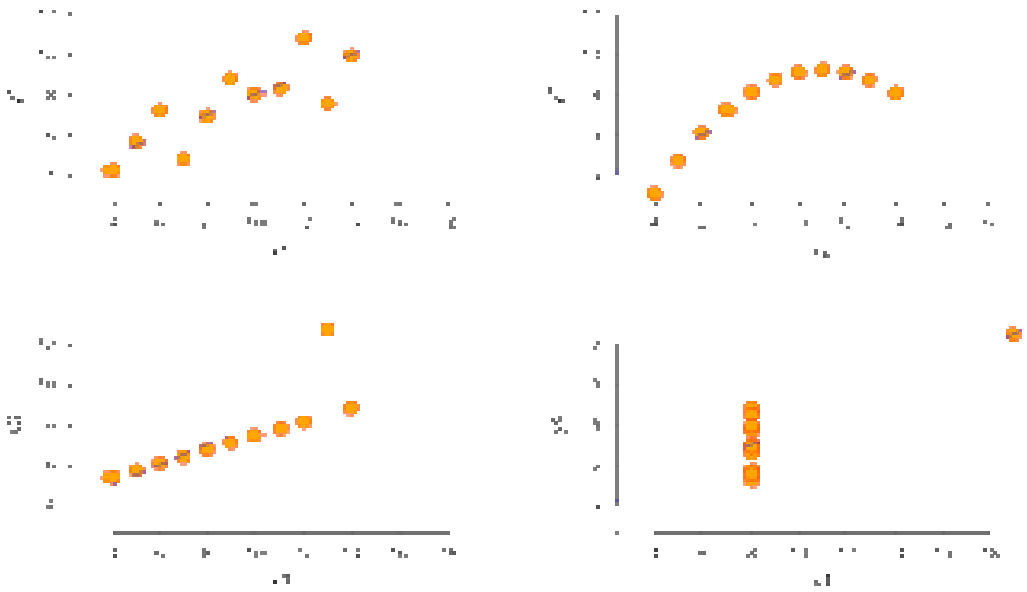
$$\mathbf{Y = a + b*X}$$

where X is the exposure variable and Y is the outcome variable. The slope of the line is b, and a is the intercept (the value of Y when X is 0) (Altman, 1999).

Figure 5.1 presents four scatterplots of four different pairs of variables, first described by Anscombe (1973). The four Y variables have the same mean (7.5), standard deviation (4.12), correlation (.81) and regression line (Y = 3 + .5X). However, as can be seen on the plots, the distribution of the variables is very different. The first one (top left) seems to be distributed normally, and corresponds to what one would expect when considering two variables which are correlated and follow the assumption of normality. The second one (top right) is not distributed normally; while an obvious relationship between the two variables can be observed, it is not linear, and the Pearson correlation coefficient is not relevant. In the third case (bottom left), the linear relationship is perfect, except for one outlier which exerts enough influence to lower the correlation coefficient from 1 to 0.81. Finally, the fourth example (bottom right) shows another example when one outlier is enough to produce a high correlation coefficient, even though the relationship between the two variables is not linear.

These examples illustrate why that correlation coefficient, as a summary statistic, cannot replace the individual examination of the data (Hutton, 1997).

Figure 5.1 Correlation and linearity (Anscombe, 1973)



Logistic regression

Binomial (or binary) regression is a form of regression which is used when the outcome is a dichotomy and the exposures are of any type (Altman, 1999).

Logistic regression can be used to predict an outcome variable on the basis of continuous and/or categorical exposures and to determine the percent of variance in the outcome variable explained by the exposures; to rank the relative importance of exposure variables; to assess interaction effects; and to understand the impact of covariate control variables.

Logistic regression applies maximum likelihood estimation after transforming the outcome into a logit variable (the natural log of the odds of the outcome occurring or not). In this way, logistic regression estimates the probability of a certain event occurring and calculates changes in the log odds of the outcome (Altman, 1999).

Logistic regression was used to test the relationship between the quality of parent-child relationship and health care utilisation, specifically hospital admission, controlling for different factors. Odds ratios (ORs), 95% confidence intervals (CIs), B coefficients, standard errors (S.E.s) and p values were reported. To examine the relationship between parenting and health outcome, four steps using logistic regression were conducted. The first step was to test univariate models examining the relationship between each childhood experience and the health outcome (hospital admission-binary variable) when other childhood experiences were not in the model. The second step, in multivariate analyses, examined the relationship between all the initially statistically significant childhood experiences and hospital admission. The third step introduced the confounder variables, and the forth the potential mediators. The multivariate models were presented separately for males and females.

Poisson regression

Poisson regression is a form of analysis common in event history analysis and other research involving rare events where assumptions of a normally distributed outcome variable do not apply. Continuous predictor variables may be added as covariates in Poisson regression models, and categorical variables may be added as factors. Poisson regression is often used to model the number of occurrences of an event of interest or the rate of occurrence of an event of interest, as a function of some exposure variables. In Poisson regression it is assumed that the outcome variable Y, number of occurrences of an event, has a Poisson distribution given the predictor variables X1, X2, ..., Xm,

$$P(Y=k| X1, X2, ..., Xm) = e^{-\mu} \mu^{k} / k!, \qquad k=0, 1, 2, ...,$$

where the log of the mean μ is assumed to be a linear function of the predictor variables. That is,

$$\log(\mu) = a + b1*X1 + b2*X2 + ...+ b3*Xm,$$

where a is the intercept and which implies that μ is the exponential function of the predictor variables,

$$\mu = e^{(a + b1*X1 + b2*X2 + ...+ b3*Xm)}$$

The maximum likelihood method is used to estimate the parameters of Poisson regression models.

The same four steps of the logistic regression models were used to build up the Poisson regression models. The difference is in regards to the health outcome, which in this case was treated as a count and was represented by the number of doctor visits (number of visits to the general practitioner or to a hospital-outpatient centres). The univariate and multivariate models were presented separately for males and females, and the number of doctors visits were calculated also by gender. Incidence Rate ratios (IRRs), 95% CIs, B coefficients, S.E.s and p values were reported.

5.4 Information regarding Christchurch Health and Development Study

Christchurch is the largest city in the South Island of New Zealand and the third largest city in the country. It is a coastal city, situated in the middle of the South Island's East coast.

The CHDS was started more than a quarter of a century ago. During this time, the health, education and life progress of a group of 1,265 children born in the Christchurch urban region during mid 1977 has been followed up. This cohort has been studied from infancy into childhood, adolescence and

adulthood. The study has published over 250 scientific papers, books and book chapters describing the 25 year life history of the CHDS cohort.

The researchers at the Christchurch School of Medicine & Health Sciences, lead by Professor Fergusson, conducted the research on the Christchurch cohort starting with the period from 0-5 years, focusing on social paediatric issues such as breastfeeding, childhood accidents, respiratory illness, parental smoking, and birth weight. Once the cohort entered school the focus began to shift away from a physical health-based approach to look more at psycho-social and educational/behavioural adjustment, covering issues such as attention deficit disorders, educational achievement, early development of cigarette smoking and alcohol consumption. As the children moved into adolescence and young adulthood the themes moved with them, towards psychosocial disorder and mental health problems such as depression, anxiety disorders, suicidal behaviours, conduct problems, crime, substance abuse, and illicit drug use.

Childhood sexual abuse has also been a major theme, especially as the cohort began to enter young adulthood and adolescence. Although adolescents have low rates of serious illness (Haggerty, 1983), they experience substantial variation in the levels of physical complaints they report and in the degree to which they report health changes over time.

The CHDS current research plan centers around investigating seven major research themes: the mental health effects of substance use in young adults, suicidal behaviours in young adults, unemployment and personal adjustment, mental health and treatment seeking, domestic violence in young adults, the transition to parenthood and parenting, and Maori health.

The analyses presented in this thesis are based on the CHDS data, as the result of the collaboration initiated by Professor Stewart-Brown from the University of Warwick in 2003. The researchers at the Christchurch School of Medicine & Health Sciences did not use the data to investigate the link between childhood experiences and health in later life, and this what the author tried to investigate in this dissertation.

5.5 Research Questions

The purpose of this study was to investigate the effect of parent-child relationships on physical health in later life.

Using epidemiological longitudinal data, the following questions were addressed:

1. What is the nature and strength of the relationship between parent-child relationship and health, specifically, health care utilisation?
2. What are the relationships in the home which matter (looking at parental-child interaction and abuse)?
3. Does this relationship differ according to gender?
4. Is this relationship altered by other factors like family functioning, family structure, family socioeconomic status, child's personality or mental health?

5.6 Results

5.6.1 Descriptive analyses

The CHDS recruited 1,265 children (50% boys) born in Christchurch in mid 1977, who were followed up at four months, one year, at annual intervals to age 16, and again at age 18-25.

The data set contains information on all 1,265 sample members who were enrolled in the study at birth. However, through the normal processes of

sample attrition in longitudinal research, adult health data is available on just over 1,000 subjects at ages 21, 25. The attrition rate was around 21%.

As seen below in Table 5.1, within the cohort, the family of upbringing was mainly of European origin (85%), with 13% of New Zealand Maori origin and 2% of Pacific Island origin. Most of the children were born in white collar families. More than half of the mothers (51%) and 48% of fathers did not have any formal educational qualifications when the children were born. Most of the children grew up in two-parent families (92%) (Table 5.1).

The majority of adolescents left school with recognized qualifications (81%), and 67% did not attain a degree by the age of 25 (Table 5.1).

Table 5.1 Demographic characteristics of the cohort

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Gender						
Male		635			50	
Female			630			50
Maternal education at child's birth						
No formal educational qualifications	647	319	328	51	50	52
Secondary qualifications	383	206	177	30	33	28
Tertiary qualifications	235	110	125	19	17	20
Paternal education at child's birth						
No formal educational qualifications	587	284	303	48	47	50
Secondary qualifications	406	218	188	32	35	32
Tertiary qualifications	221	109	112	18	18	18
Family socio-economic status at the time of the survey						
Professional, managerial	255	119	136	20	19	22
Clerical, technical, skilled	668	332	336	53	52	53
Semiskilled, unskilled, unemployment	342	184	158	27	29	25
Ethnicity						
New Zealand Maori	134	64	70	13	13	13
Pacific Island	24	18	6	2	3	1
Other (essentially European)	878	428	450	85	84	86
Family type						
Single parent	98	48	50	8	8	8
Two-parent	1167	587	580	92	92	92
Leaving school without qualifications						
Left school with recognized qualifications	849	401	448	81	77	84
Left school without recognized qualifications	203	120	83	19	23	16
Highest level of tertiary enrolment by age 21						
No enrolment in tertiary education	369	195	174	37	40	35
Enrolled for basic work skills/trade qualification	140	68	72	13	13	13
Enrolled for trade certificate or technical diploma level course below degree level	163	86	77	16	17	15
Enrolled for university or equivalent degree	339	147	192	34	30	37
Attained degree by age 25						
Did not attain degree	670	397	326	67	70	63
Attained degree by age 25	333	109	189	33	30	37

Basic summaries for exposure and outcome variables will be presented in the tables below. Histograms are available in the Appendix 2 of this thesis.

5.6.1a Family functioning variables

Two measures of family functioning were used in the analyses: family conflict and interparental violence.

Family conflict

As part of the annual assessments from age 1-10 years parents were questioned on three items which described the quality of marital relationships. These items were:

1. Whether the parents had engaged in prolonged arguments during the last 12 months;
2. Whether the child's mother reported being assaulted by her spouse in the last 12 months;
3. Whether the child's mother had reported experiencing sexual difficulties in the last 12 months.

These items were combined to produce a factor score measure of the extent of interparental conflict in the period from birth to age 10 years.

As shown in Table 5.2, the variable was not normally distributed and the interquartile range for this variable was -0.60 to 8.60, with most families (50%) showing a value of -0.50. There were very few extreme values.

Table 5.2 Summary statistic for family conflict

Variable	Valid cases	Missing cases	Mode	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
Family conflict	997	268 (27%)	-0.50 (50%)	-0.60	-0.50	-0.50 (50%)	0.05	8.60

Interparental violence

At age 18, sample members were questioned using items from the Parent-Child Conflict Tactics Scale (see Appendix 2) to assess the extent to which they had witnessed incidents of physical violence or serious threats of physical violence between their parents during childhood. The variable was recoded as a binary variable by researchers at Christchurch School of Medicine & Health Sciences. Fifty-six percent of adolescents reported no incidents of violence, while 44% reported one or more incidents (Table 5.3).

Table 5.3 Summary statistic for interparental violence

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Interparental violence						
No incidents	571	290	281	56	57	54
One or more incidents	454	215	239	44	43	46

5.6.1b Measures of parent-child relationship

Child physical punishment

At age 18 and 21 years sample members were questioned concerning the extent to which their parents used physical punishment during childhood (<16 years). Separate questioning was conducted for mothers and fathers. Reports were made on a five-point scale ranging from 'parent never used physical punishment' to 'parent treated me in a harsh and abusive way.' The ratings for both parents were combined into a single rating by classifying the young person's reported exposure to physical child abuse into a composite four-point scale based on the greatest exposure to physical punishment reported by the respondent. This classification revealed that 5% of the sample reported that neither parents used physical punishment; 78% of respondents reported that both parents seldom used physical punishment;

11% of respondents reported that at least one parent used physical punishment methods regularly; 6% of respondents reported that at least one parent used physical punishment methods too often and too severely.

The variable was recoded into a binary classification during the analyses:

0 = Parents never used physical punishment + Parents rarely used physical punishment

1 = At least one parent regularly used physical punishment + At least one parent used physical punishment too often or too severely or treated the young person in a harsh/abusive manner

Most of children were rarely or never physically punished by their parents (82%), with boys being more likely than girls to be physically punished (19% vs. 16%) (Table 5.4).

Child sexual abuse

At age 18 and 21 years, sample members were questioned about their experience of sexual abuse in childhood (<16 years). Sample members who reported any episode of abuse were further questioned about the extent, nature and context of the abuse.

Using these report data, a measure of the severity of abuse was constructed based on the most severe form of abuse reported by the individual at either age 18 or 21 years. A binary recoding was used during the analyses:

0 = No sexual abuse + Non-contact abuse only (e.g. indecent exposure)

1 = Contact abuse not involving attempted/completed intercourse + Attempted/completed oral, anal or vaginal intercourse

The percentage of sexually abused children was 14%, with girls being victims more often than boys (23% vs. 5%), (Table 5.4).

Table 5.4 Summary statistic for child physical punishment and child sexual abuse

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Child physical punishment						
Parents never used physical punishment + Parents rarely used physical punishment	868	421	447	82	81	84
At least one parent regularly used physical punishment + At least one parent used physical punishment too often or too severely or treated the young person in a harsh/abusive manner	185	100	85	18	19	16
Child sexual abuse						
No sexual abuse + Non-contact abuse only (indecent exposure)	905	493	412	86	95	77
Contact abuse not involving attempted/completed intercourse + Attempted/completed oral, anal or vaginal intercourse	148	28	120	14	5	23

Parental Bonding Instrument (PBI)

1. PBI maternal care scale: Range: 3-36.

2. PBI paternal care scale: Range: 0-36.

3. PBI maternal overprotection scale: Range: 0-31.

4. PBI paternal overprotection scale: Range: 0-33.

The above measures were obtained using the PBI (Parker, Tulping, & Brown, 1979) administered when sample members were aged 16. The measure is 'retrospective', meaning that participants complete the measure for how they remember their parents during their first 16 years. This instrument asked respondents to rate the quality/nature of their relationships with their parents throughout their childhood. The instrument produced two scale scores for each parent, reflecting the perceived quality of parental care and the extent of parental overprotection during childhood (see Appendix 2).

The care scale measured the extent to which the parents provided support, affection and nurturing with a high score indicating high levels of care, so

high values were good values, reflecting the positive spectrum of parental care.

The overprotection scale measured the extent to which parents exhibited tendencies to overprotection or over control with a high score indicating tendencies to over control, so high values were bad values, reflecting the negative spectrum of parental overprotection.

There were 25 item questions, including 12 'care' items and 13 'overprotection' items.

In this study there were more missing data for paternal scales reflecting the fact that a minority of sample members brought up in single parent families were unable to identify a father figure.

The alpha coefficients for the maternal and paternal care and overprotection scales were high, ranging from .85 to .91

The attrition rates for these variables were around 25% (Table 5.5).

Table 5.5 Summary statistic for Parental Bonding Instrument

Variable	Valid cases	Missing cases	Mode
PBI maternal care scale	947	318 (25%)	36 (23%)
PBI paternal care scale	912	353 (28%)	36 (16%)
PBI maternal overprotection scale	947	318 (25%)	0 (10%)
PBI paternal overprotection scale	912	353 (28%)	0 (17%)

The four measures were not normally distributed. The data were highly skewed towards the good values for the fours scales. The lower 25% of cases had values of 26 and 24 for PBI maternal scale and paternal scale and 2 and 1 for PBI overprotection maternal and paternal scales. The upper 25% of cases had values of 35 and 34 for PBI maternal scale and paternal scale

and 12 and 11 for PBI overprotection maternal and paternal scales (Table 5.6).

Table 5.6 Summary statistic for Parental Bonding Instrument (all valid cases, excluding the missing data)

Variable	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
PBI maternal care scale	3	26	32 (6%)	35	36 (23%)
PBI paternal care scale	0	24	30 (5%)	34	36 (16%)
PBI maternal overprotection scale	0 (10%)	2	6 (6%)	12	31
PBI paternal overprotection scale	0 (17%)	1	5	11	33

In order to investigate the distribution of the majority of the data, cases presenting maximum values equal with the modal values were excluded, and a new table presenting the median, range and lower and upper quartiles was constructed (Table 5.7).

Table 5.7 Summary statistic for Parental Bonding Instrument (excluding the modal value' cases which show maximum values for PBI maternal and paternal care scales and minimum values for PBI maternal and paternal overprotection scales)

Variable	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
PBI maternal care scale	3	24	30 (6%)	33	35 (11%)
PBI paternal care scale	0	23	28	32	35 (8%)
PBI maternal overprotection scale	1 (9%)	3	7 (6%)	12	31
PBI paternal overprotection scale	1 (11%)	3	7 (5%)	12	33

After excluding the modal values, the non-parametric correlation coefficients were high, PBI paternal care being positively correlated with PBI maternal care (.615; $p<.01$) and negatively correlated with PBI overprotection

maternal scale (-.466, p<.01) and PBI overprotection paternal scale (-.535, p<.01).

PBI maternal care was negatively correlated with PBI overprotection maternal scale (-.595, p<.01) and PBI overprotection paternal scale (-.504, p<.01).

Maternal overprotection scale and paternal overprotection scale were positively correlated (.687, p<.01).

Home Observation for Measurement of the Environment (HOME) Inventory

1. Maternal emotional responsiveness

This is a measure of the quality of mother-child interactions obtained using the maternal emotional responsiveness subscale of HOME Inventory when the children were aged 3 years (see Appendix 2). It is an observational measure that measures the extent of positive maternal responses to the child: scores range from 0-10 with a high score indicating high levels of positive emotional responsiveness by the mother. The score was computed by the home visitor through observation, and the reliability of the scale was .69.

Seven percent of the mothers scored between 0 and 5, 39% scored between 6 and 8, and 54% presented maximum values of 9 and 10.

2. Maternal use of punishment

This is another measure of mother-child interactions derived using the maternal avoidance of punishment and restriction subscale of the HOME Inventory. This scale measured the extent of maternal punitiveness in responding to the child (see Appendix 2).

Scores ranged from 0-5 with a low score indicating an absence of punitive responses. The score was computed by the home visitor through observation, and the reliability of the scale was .71.

Scores of 0 were common for 35% of mothers, scores of 1 for 49% of mothers and scores of 2 to 5 for only 16% of mothers.

Parental attachment

The quality of attachment to parents was assessed at age 15 using the Armsden and Greenberg (1987) scale of parental attachment (see Appendix 2).

Subjects completed a 28-item questionnaire by indicating how often each statement was true for them on a 5-point Likert scale. Respondents indicated whether the following items were almost always or always true, often true, sometimes true, seldom true, or almost never or never true. The two extreme responses were scored as 1 or 5, depending on whether an item was positively or negatively worded.

The scale range was 32 to 84 with a good spread of the scores towards the maximum values and had a reliability of .97. Ten percent of the parents scored between 32 and 59, 20% scored between 60 and 69, 17% scored between 70 and 74, 22% scored between 75 and 79 and 31% scored between 80 and 84 (Table 5.8).

Table 5.8 Summary statistic for parental attachment

Variable	Valid cases	Missing cases	Mode	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
Parental attachment	965	300 (24%)	84 (8%)	32	68	75 (3%)	81	84 (8%)

5.6.1c Outcome variables

The considered outcome variables were as follows:

Hospital admission: age 18-25

The following measures were abstracted from hospital record data for sample members, and an overall hospital admission for physical health problems variable was created and coded as:

0 = no admission to hospital age 18-25

1 = admission to hospital age 18-25

The hospital admission included:

1. Hospital admission for complications of pregnancy 18-21 years;

2. Hospital admission for complications of pregnancy 22-25 years;

These included both antenatal and postnatal complications (e.g. high blood pressure, excessive bleeding, ectopic pregnancy).

3. Hospital admission for pregnancy termination 18-21 years;

4. Hospital admission for pregnancy termination 22-25 years;

These include all elective abortions.

5. Hospital admission for gynaecological problems 18-21 years;

6. Hospital admission for gynaecological problems 22-25 years;

These included all gynaecological conditions other than those directly related to pregnancy/childbirth.

Although the above measures were relevant only to women, the variables were defined for the whole sample, and were coded zero for males.

7. Hospital admission for accident/injury 18-21 years;

8. Hospital admission for accident/injury 22-25 years;

9. Hospital admission for other physical health problem 18-21 years;

10. Hospital admission for other physical health problem 22-25 years.

These included all admissions for physical health problems other than those resulting from accident/injury admissions and admissions for gynaecological problems and admissions for pregnancy/childbirth. In general, more women than men were likely to be admitted to hospital for different conditions, as seen in Table 5.9 (47% vs. 31%). The elective abortions and antenatal and postnatal pregnancy complications were included in the overall admissions for physical health, as they were considered important in reflecting women's health problems.

Table 5.9 Summary statistic for hospital admissions

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Hospital admission						
No admission	628	351	277	61	69	53
Admission	398	155	243	39	31	47

Number of visits to the general practitioner or to a hospital (outpatient centres) during the last year for age 18-25

The visits were made for different complaints such as:

1. Physical health problems: head colds, flu, throat infections; chesty cold, bronchitis; asthma; hay fever, sinus or similar problems; ear infections, hearing problems; eye infection, vision problems; eczema, acne, other skin problems; vomiting, diarrhoea; abdominal pain (other than menstrual); headaches, migraines;

2. Contraceptive advice;

3. Menstrual, gynaecological problems;

4. Sexually transmitted diseases (e.g. herpes, Chlamydia etc);

5. Other urinary or genital problems;

6. Injuries (fractures, sprains, lacerations etc);

7. Other physical health problems.

The basic frequencies are presented in Table 5.10, with most of the participants having more than four visits to the doctor during the last year.

Table 5.10 Summary statistic for visits to the doctor during the last year

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Visits to the doctor during the last year						
0 visits	74	50	24	8	11	5
1 visit	104	62	42	10	13	8
2 visits	107	62	45	11	13	9
3 visits	113	64	49	12	13	10
More than 4 visits	580	236	344	59	50	68

5.6.1d Mediators

Different variables were considered mediators of the pathway linking the quality of parent-child relationship with health in later life. The concept of mediators in medical statistics was discussed in the Methodology part of this chapter.

Basic summaries of the mediators are presented below.

Psychiatric disorders and suicide ideation

At the age of 18, subjects were questioned about their psychiatric symptoms over the period from 16-18 years using a questionnaire based on the Composite International Diagnostic Interview (CIDI; World Health Organization, 1990), supplemented by an instrument based on the Self-Report Delinquency Inventory (SRDI; Elliott, & Huizinga, 1989). The CIDI items were used to assess mood disorders and anxiety disorders in the sample while the SRDI was used to assess conduct disorders.

Using this information, DSM-IV criteria (American Psychiatric Association, 1994) were used to construct a series of diagnoses of psychiatric disorder for each subject over the period from 16 to 18 years. These diagnoses included the following: (1) Conduct disorder; (2) Major depression; and (3) Anxiety disorders.

Additionally, subjects were questioned about suicidal behaviours during the period from age 16 to age 18 years. On the basis of this information, a measure was constructed reflecting whether the subject had ever made a suicide attempt during this period.

A binary coding was used during the analyses:

0 = No disorder/mental health problem

1 = Disorder/mental health problem

Substance abuse

At age 18 subjects were questioned about their substance abuse behaviours during the two previous years, using a number of questionnaires.

The diagnoses included: (1) Nicotine dependence, (2) Alcohol abuse/dependence, and (3) Cannabis abuse/dependence.

A binary coding was used during the analyses:

0 = No substance abuse

1 = Substance abuse was mentioned

Overall, males were more likely to use drugs and present conduct disorders, while females were more likely to be diagnosed with depression, anxiety, or suicide attempts.

Percentages were similar for alcohol abuse (Tables 5.11).

Table 5.11 Summary statistic for psychiatric illnesses and substance abuse

Variable	Frequency			Percentage		
	Total	Male	Female	Total	Male	Female
Major depression						
No	799	436	363	78	86	70
Yes	226	69	157	22	14	30
Anxiety						
No	850	446	404	83	88	78
Yes	175	59	116	17	12	22
Conduct disorders						
No	976	465	511	95	92	98
Yes	49	40	9	5	8	2
Suicide attempt						
No	874	447	427	85	89	82
Yes	151	58	93	15	11	18
Drug use						
No	900	421	479	88	83	92
Yes	125	84	41	12	17	8
Alcohol abuse						
No	826	394	432	81	78	83
Yes	199	111	88	19	22	17

Deviant peer relationships

At age 15 sample members were questioned on a series of items concerning the extent to which their friends used tobacco, alcohol or illicit drugs, truanted from school or broke the law. These items were used to construct a scale score measure of the extent to which the young person reported affiliating with delinquent or substance using peers. The range was between 2-12, with 80% of the participants scoring between 2 and 6, 6% scoring 7, 5% scoring 8, 4% scoring 9, and 5% scoring between 10 and 12. The percentage of missing data was 24 (300 cases). The reliability coefficient was .86.

Peer attachment

The quality of young people's attachment to peers was assessed using the self report peer attachment scale developed by Armsden and Greenberg (1987, see Appendix 2). The range was between 37-75, with most of the participants achieving higher score (92% scored between 56 and 75). The

percentage of missing data was 25 (156 cases) and the reliability coefficient was .85.

Child self esteem score

At age 15 years subjects were administered the Coopersmith Self Esteem Inventory (SEI) (see Appendix 2). The variable represents the total self esteem score for each subject. The range was between 20-49 (high scores indicate high self-esteem), and the reliability coefficient was .76. The percentage of missing data was 25 (156 cases) and 93% of the participants scored between 31 and 49. The reliability coefficient was .76.

Child neuroticism

This was assessed at age 14 years using a short-form version of neuroticism scale of the Eysenck Personality Inventory (see Appendix 2). It ranged between 10-30 (high scores indicate higher levels of neuroticism) and had a reliability coefficient of .80. Sixty-four percent of the participants scored between 10 and 14, 35% scored between 15 and 24, with very few participants scoring between 25 and 30. The percentage of missing data was 23 (288 cases), and the reliability coefficient was .80.

Child novelty seeking

Child novelty seeking was assessed at age 16 years using the novelty seeking scale of the Tridimensional Personality Inventory (see Appendix 2). The range was between 3-31, the variable being almost normally distributed (mean=18; standard deviation=5), with a reliability coefficient of .76. The percentage of missing data was 26 (162 cases).

5.6.1e Confounders

The concept of confounders in medical statistics was presented in the Methodology part of this chapter.

To assess the extent to which the associations between exposures in childhood and outcomes in young adulthood could be explained by the effects of confounding factors, the following measures were chosen from the data base of the study for inclusion in the analyses. These measures were selected on the following basis:

1. A review of the literature identified factors which have been previously found to be associated with increased risks of disease during young adulthood.

2. Previous analyses based on the CHDS cohort which have identified possible confounder variables (Fergusson, Horwood, & Lynskey, 1996).

The following factors were chosen for inclusion in the analyses:

Family functioning

The measures of family functioning were previously presented in this chapter.

Family type (one parent/two-parent family)

Data were presented in the sample demographics.

Ethnicity

Data were presented in the sample demographics.

Maternal age

Maternal age at the time of the child's birth was recorded in whole years and ranged between 15-47. The maternal age mean was 26, with a standard deviation of 5, the variable being normally distributed. The percentage of missing data was 0.2 (2 cases).

Maternal education

Data were presented in the sample demographics.

Averaged family income deciles (1-10 years)

Each year families were asked to provide estimates of gross family income. These estimates were transformed to real income levels using 1987 income as a base, and the resulting estimates were summed and divided by 10 to obtain an estimate of typical family income levels throughout the 10 year period.

The range was between 1.0-10.0 with lower scores implying lower incomes; because of the distribution of the values, data was analysed in relation with the score of four: 30% of the families scored less than 4, and 70% between 4 and 10. The percentage of missing data was 5 (66 cases).

Averaged interviewer rating of standard of living (1-10 years)

At each assessment from age 1 to age 10 years, interviewer ratings of the family's standard of living were obtained based on a 5-point scale ranging from 1=family obviously affluent, well to do, to 5=family obviously poor or very poor. To provide an overall estimate of the family's living standards during childhood, the interviewer ratings were averaged over the interval 1-10 years. The range was between 1.0-5.0 with lower scores implying higher living standards; 5% of the families scored between 1-1.99, 44% between 2-2.99, 49% between 3-3.99, 2% between 4-5. The percentage of missing data was three (43 cases).

Changes of parents

As part of the study comprehensive data on changes of parents were collected at annual intervals (Fergusson, Horwood, & Lynskey, 1992). This

data was used to construct a measure of whether or not the child had experienced a change of parent figure during the interval from birth to the age of 15 years. A change of parent was counted if a parent left the family as a result of family breakdown or death, or entered the family as a result of remarriage or reconciliation.

The range was between 0-19 and the percentage of missing data was 24 (297 cases); 64% of the children did not encounter any changes, 9% had one change, 9% had 2 changes, 6% had 3 changes, 4% had 4 changes, 2% had 5 changes, 3% had 6 changes and 3% between 7 and 19 changes.

5.6.2 Missing data

Table 5.12 presents the available data for the CHDS at different ages, for the total number of participants and for male participants, so one could notice the attrition process from birth to the age of 25.

At birth there was complete information available on most of the variables (gender, maternal age, maternal education, family type). For most of the exposure (different scales of the HOME Inventory, of the Parental Bonding Instrument, or child physical punishment or sexual abuse) and outcome variables (number of visits to the doctor or hospital admission), information was lost to follow up and at the age of 25 the attrition rate was around 21%.

Table 5.12 Available data at different ages

Age group	Variable	Sample N (%)	Males N (%)
Birth	**Gender**	1265 (100%)	635 (100%)
	Maternal age	1263 (99%)	635 (100%)
	Maternal education	1265 (100%)	635 (100%)
	Family type	1265 (100%)	635 (100%)
Age 3	**HOME maternal emotional responsiveness**	1150 (91%)	576 (91%)
	HOME maternal avoidance of punishment	1150 (91%)	576 (91%)
Age 15	**Parental attachment**	965 (76%)	479 (75%)
Age 16	**PBI maternal care**	947 (75%)	471 (74%)
	PBI paternal care	912 (72%)	452 (71%)
	PBI maternal overprotection	947 (75%)	471 (74%)
	PBI paternal overprotection	912 (72%)	452 (71%)
Age 18-21	**Child physical punishment**	1053 (83%)	521 (82%)
	Child sexual abuse	1053 (83%)	521 (82%)
	Interparental violence	1025 (81%)	505 (80%)
Age 18-25	**Number of visits to the doctor**	1026 (81%)	506 (80%)
	Hospital admission	1026 (81%)	506 (80%)

Table 5.13 presents the attrition process at different age groups. At the age of 3, it is likely that parents did not answer the follow up questions, where adolescents were likely to refuse participation at age 15 and 16. Probably at

the age of 18, the percentage of 19, truly represents the drop out rate, and not the likelihood of answering or not some questions, or to not participate at some intermediate follow ups.

In a study published in 1997, researchers at Christchurch (Fergusson & Lynskey, 1997) mentioned that at the age of 18, losses to follow up arose from migration from New Zealand (56%), refusal to participate in the research (36%), and mortality (18%).

At the age of three, when data regarding HOME Inventory were collected, there were 115 missing cases. If 18% of the children were dead by the age of three, that means there were 21 deaths, which represents a prevalence of 0.83 per 1,000 population for death in infancy. The mortality rate is comparable with the actual mortality death for children aged 0-3 in the United Kingdom (0.3 per 1,000 population for males and 0.3 per 1,000 population for females in 2001; United Kingdom Office for National Statistics).

Small differences were found between individuals with complete data versus those without.

The participants with missing data on the hospital admission outcome variable, had also missing data on the number of doctor visits outcome variable, with the exception of 47 individuals.

Table 5.13 Missing data at different ages

Age group	Gender All data N (%) Males N (%)	HOME MER All data N (%) Males N (%)	PA All data N (%) Males N (%)	PBI mcare All data N (%) Males N (%)	PBI pcare All data N (%) Males N (%)	IV All data N (%) Males N (%)
Birth	1265 (100%) 635 (50%)					
Age 3		1150 (91%) 576 (91%)				
Age 15			965 (76%) 479 (75%)			
Age 16				947 (75%) 471 (75%)	912 (72%) 452 (71%)	
Age 18						1025 (81%) 505 (80%)

Males = Number and percentage of the original sample
HOME MER = HOME Inventory Maternal Emotional Responsiveness
PA = Parental Attachment
PBI mcare = Parental Bonding Instrument-maternal care scale
PBI pcare = Parental Bonding Instrument-paternal care scale
IV = Interparental Violence

Table 5.14 presents the differences between demographic and exposure variables for those with missing data on hospital admission and for those with complete data.

For most of the variables, at least 88% participants with missing data on hospital admission, had also missing data on demographic and exposure variables. The only exceptions refer to average family income deciles and maternal emotional responsiveness. Relatively more participants with

missing data on hospital admission were in the lower family income deciles (43%) than in the higher (34%). For maternal emotional responsiveness, the percentage of missing data participants with low values on the HOME inventory subscale (11%) was almost twice the percentage of those with complete data (5%).

It is also interesting to observe that in the case of child physical punishment and child sexual abuse, the percentages of participants were null for those admitting abuse, and most of the data were missing (88%). One could hypothesise that probably some of the missing data were in fact cases of abuse but those participants were likely to be the ones lost to follow up, as the data on child abuse were retrospectively collected at either age of 18 or 21. The hypothesis is based on similar data, for example the Dunedin Multidisciplinary Health and Development Study, where 962 26 year old adults (born in Dunedin, New Zealand) were interviewed about their experiences of discipline in childhood. Of the study members providing data, 80% reported receiving physical punishment at some time during childhood, and physical punishment on a regular basis was reported by 71% of study members (Millichamp, Martin, & Langley, 2006).

Table 5.14 Comparing demographic and exposure variables on hospital admission variable (those with complete data versus those with missing data)

Variable	Hospital admission (missing data) N=239 (%)	Hospital admission (complete data) N=1026 (%)	Hospital admission (all data) N=1265 (%)
Ethnicity			
Maori	0	13	11
Pacific Island	0	2	2
Other	6	84	70
Missing	94	1	18
Average family income deciles			
1.00-5.00	43	47	47
5.10-10.00	34	52	48
Missing	23	1	5
Tertiary education			
No enrolment	3	35	29
Basic work	0	14	11
Diploma	1	16	13
Degree	3	32	27
Missing	93	3	20
PBI maternal care			
3-17	0	4	3
18-36	12	86	72
Missing	88	10	25
PBI paternal care			
0-17	0	9	7
18-36	11	77	65
Missing	89	14	28

Variable	Hospital admission (missing data) N=239 (%)	Hospital admission (complete data) N=1026 (%)	Hospital admission (all data) N=1265 (%)
HOME maternal emotional responsiveness			
0-2	11	5	6
3-10	55	91	85
Missing	34	4	9
Parental attachment			
32-58	0	8	7
59-84	14	83	70
Missing	86	9	23
Child physical punishment			
No	12	82	69
Yes	0	18	14
Missing	88	0	17
Child sexual abuse			
No	12	86	71
Yes	0	14	12
Missing	88	0	17

To examine the effects of sample losses on the representativeness of the sample, the obtained samples with complete data were compared with samples with missing data on a series of socio-demographic measures collected at birth. These analyses (X^2) suggested that there were statistically significant tendencies for the obtained samples to under-represent children from socially disadvantaged backgrounds characterized by low maternal education, low socioeconomic status at birth and single parenthood (Table 5.15).

Table 5.15 X^2 tests for comparing demographic data regarding participants with missing data and participants with complete data on hospital admission

Demographic data		Hospital admission complete data N=1026 (%)	Hospital admission missing data N=239 (%)	X^2
Maternal education	**No formal educational qualifications**	511	136	7.674**
		50%	57%	
	Secondary qualifications	310	73	
		30%	31%	
	Tertiary qualifications	205	30	
		20%	12%	
Family socio-economic status at birth	**Semiskilled, unskilled, unemployed**	253	89	15.782**
		25%	37%	
	Clerical, technical, skilled	562	106	
		55%	44%	
	Professional, managerial	211	44	
		20%	19%	
Family type	**Single parent family**	65	33	15.144**
		6%	14%	
	Two-parent family	961	206	
		94%	86%	

% for complete data: out of 1,026 for complete data
% for missing data: out of 239 for missing data
** (p<.05)
* (p<.10)

The missing data analyses below refer to hospital admission as outcome variable, and the relationship with Parental Bonding Instrument-maternal care scale. Similar analyses with similar results were performed for the other scales of PBI, HOME Inventory or parental attachment, but they are not presented in this thesis in order to avoid repetition. The aim of these analyses was to explore if the relationship between exposure variables and hospital admission would have been different, in case complete data of these variables would have been available.

An empirical logit variable was constructed based on the yes or no values for hospital admissions (outcome variable) and PBI-maternal care scale for males and females. The empirical logit variable was defined as below and it is an estimate of the log odds ratios:

Empirical logit = log ((x+0.5)/(y+0.5))

where x = PBI maternal care values for no admission to hospital during the last year, and y = PBI maternal care values for admission to hospital during the last year.

As it could be seen further, after scatter plots were constructed, for females, there was a linear relationship between PBI maternal care and the empirical logit variable, but there was no relationship for males. The graphs for PBI maternal care for males and females are presented below (Figure 5.2 and Figure 5.3).

Figure 5.2 Males: Relationship between empirical logit (XY) and PBI maternal care

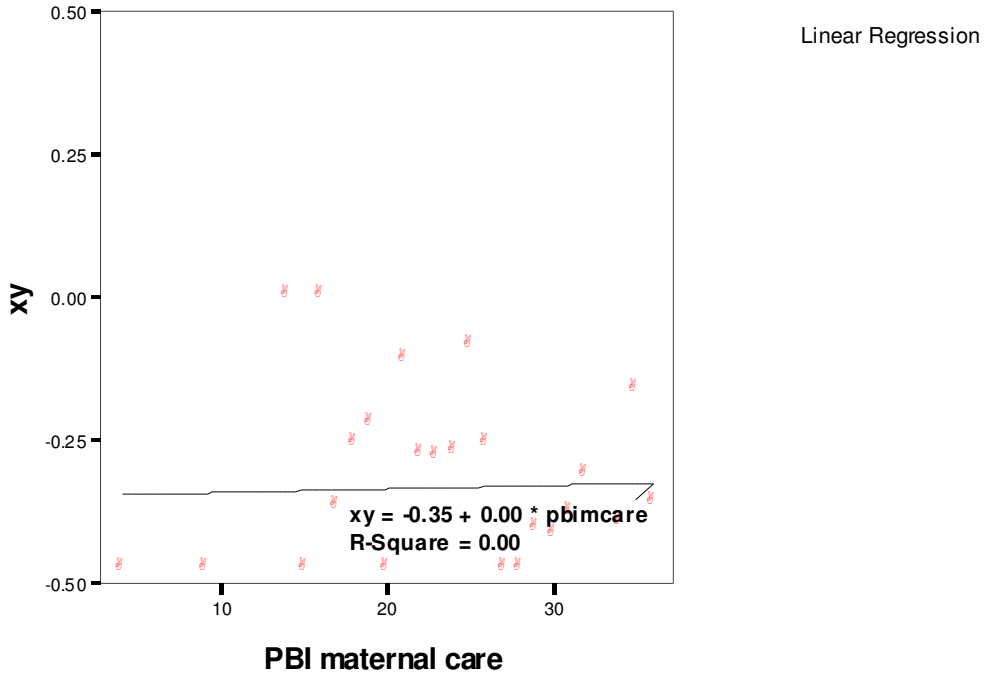
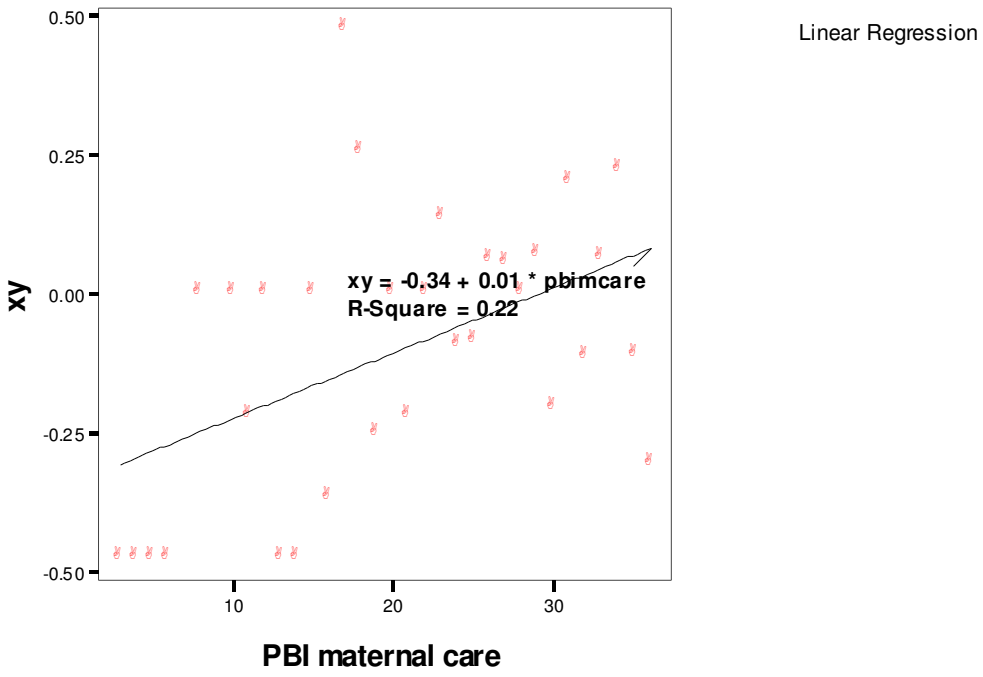


Figure 5.3 Females: Relationship between empirical logit (XY) and PBI maternal care



A positive slope in a plot against a covariate (for example, PBI maternal care for girls) means that as the covariate increases towards higher values that are considered as showing an affectionate and caring parent-child relationship, the risk of hospital admission in later life decreases. Therefore females who had a good relationship with their mother in childhood were less likely to present different symptoms or diseases in young adulthood, and consecutively less likely to be admitted to hospital for different reasons at the age of 25.

However, this information is based on the available data, but would the answer be different if the information would be complete (if there will be no missing data)? If the missing data on hospital admission would be associated

with either extreme good or bad values on PBI maternal care scale, the linear relationship would not be maintained, as presented below.

Table 5.16 presents the frequencies for hospital admission and PBI maternal care scores for females.

Table 5.16 Cross table between hospital admission and PBI maternal care scores for females

PBI maternal care scores for different age groups N=630	Hospital admission			
	No	**Yes**	**Missing**	**Total**
3-17	8	16	0	24
18-35	167	161	**7**	335
36	71	43	**3**	117
Missing	31	23	**100**	154

The interest is especially towards the participants with missing data, and one could consider three cases:

1. For the three women with missing data on hospital admission and PBI maternal care at maximum values of 36, assigning them to the 'No' category on hospital admission would be consistent with the positive slope between PBI maternal care for women and hospital admission (Figure 5.4); if they would be put in the 'Yes' category, the model would be contradicted, but given the small number of cases (three), they will not be influential on the model (Figure 5.5).

2. For the seven women with missing data on hospital admission and PBI maternal care between 18-35, the situation is similar with the one presented before (1).

3. For the 100 women with missing data on both hospital admission and PBI maternal care, one could consider 4 extreme subclasses.

a) All of the 100 women could be assigned to PBI maternal care of 36 and 'No' on hospital admission which will be in line with the model (Figure 5.6).

b) All of the 100 women could be assigned to PBI maternal care of 36 and 'Yes' on hospital admission which will contradict the model, and the slope would decrease (Figure 5.7).

c) All of the 100 women could be assigned to PBI maternal care of 3-17 and 'No' on hospital admission which will contradict the model.

d) All of the 100 women could be assigned to PBI maternal care of 3-17 and 'Yes' on hospital admission which will be in line with the model. These are only some assumptions.

From Table 5.15 it is known that children with missing data on hospital admission tend to come from a lower socioeconomic background or single-parent families. However, a formal model based on missing data that would imply that children with a lower socioeconomic status are likely to be less well-cared for by their parents and therefore, more likely to somatisize and be admitted to hospital in later life is beyond the scope of this thesis.

Figure 5.4 Females: Relationship between empirical logit (XY) and PBI maternal care, considering the case of 3 women that would not be admitted to hospital

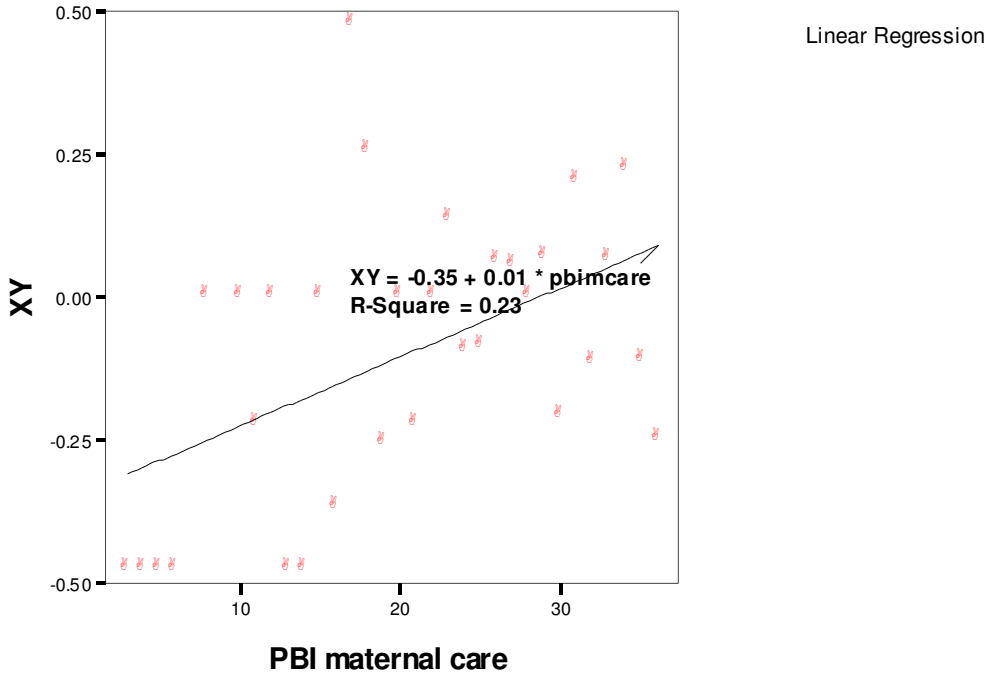


Figure 5.5 Females: Relationship between empirical logit (XY) and PBI maternal care, considering the case of 3 women that would be admitted to hospital

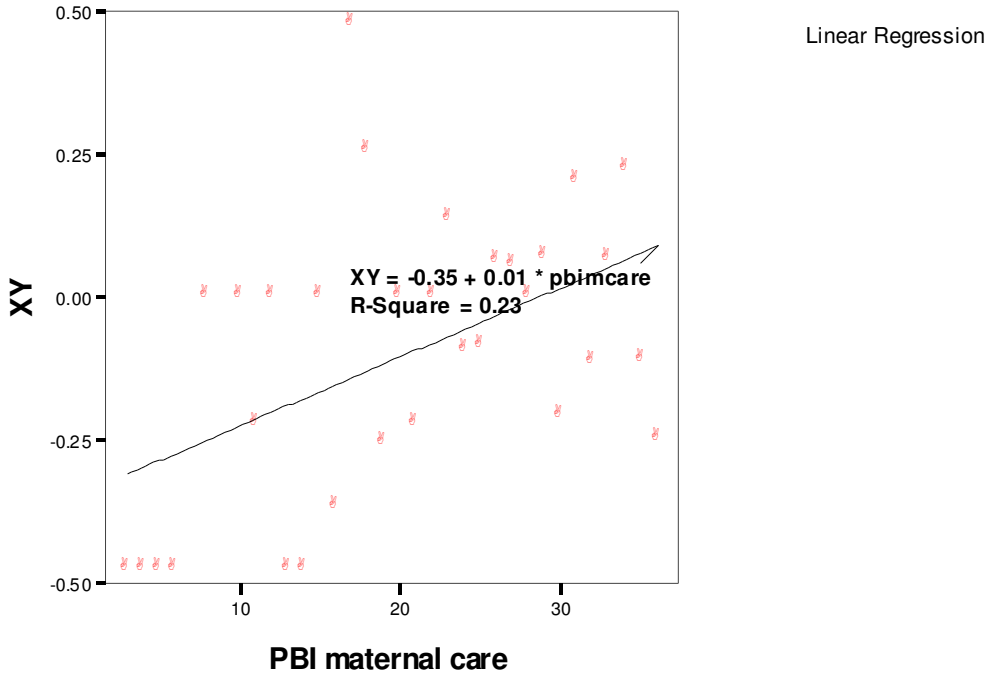


Figure 5.6 Females: Relationship between empirical logit (XY) and PBI maternal care, considering the case of 100 women that would not be admitted to hospital

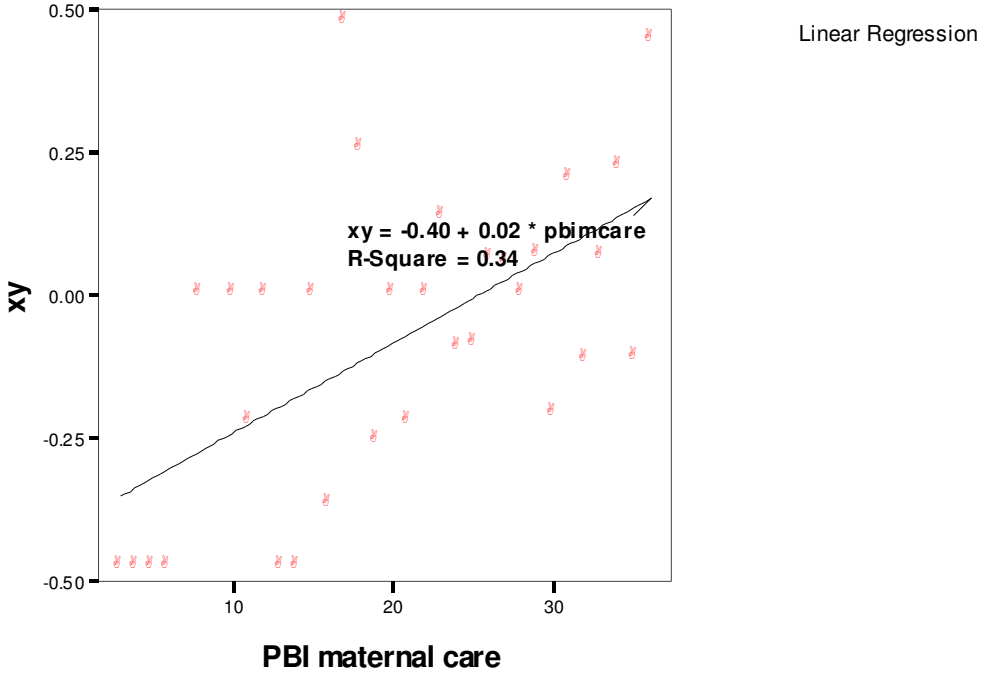
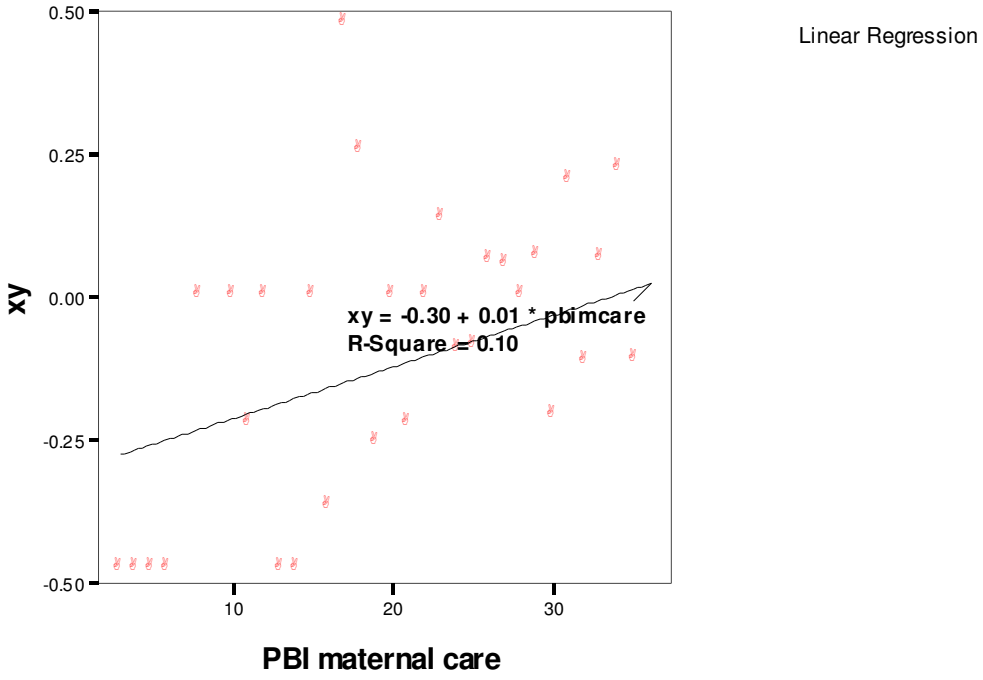


Figure 5.7 Females: Relationship between empirical logit (XY) and PBI maternal care, considering the case of 100 women that would be admitted to hospital



5.6.3 Regression models

The relationships between exposure and outcome variables were further explored using univariate and multivariate regression methods.

First, logistic regression models analysed the relationship between exposure variables and hospital admission.

5.6.3a Regression models for hospital admission as outcome variable

In univariate logistic regression analyses the following predictors: maternal and paternal care and overprotection, parental attachment and child physical punishment and child sexual abuse were statistically significant associated with hospital admission, as presented in Table 5.17, and they will be used as predictors in the final models.

In general, p values of less than .05 were considered statistically significant and p values of less than .10 were considered borderline.

Table 5.17 Univariate logistic regressions analyzing the association between exposure variables and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
PBI maternal care	**-.021**	**.011**	**.051**	**.979**	**.958**	**1.000**
PBI paternal care	**-.018**	**.009**	**.045**	**.982**	**.965**	**1.000**
PBI maternal overprotection	**.030**	**.011**	**.004**	**1.031**	**1.010**	**1.053**
PBI paternal overprotection	**.029**	**.011**	**.008**	**1.029**	**1.008**	**1.052**
HOME maternal emotional responsiveness	-.031	.042	.468	.970	.893	1.054
HOME maternal avoidance of punishment	.005	.078	.947	1.005	.863	1.171
Parental attachment	**-.018**	**.007**	**.010**	**.982**	**.969**	**.996**
Child physical punishment	**.497**	**.164**	**.002**	**1.644**	**1.191**	**2.268**
Child sexual abuse	**.460**	**.179**	**.010**	**1.584**	**1.115**	**2.251**

Given the considerable colinearity between the continuous exposure variables which is presented in Table 5.18, a more coherent approach to

multivariate modelling was pursued. The parenting variables were correlated in the expected direction. Based on the univariate logistic regression B coefficients values, maternal overprotection (the highest value for the B coefficient) was chosen for the multivariate regression models.

Based on the research questions outlined earlier in this chapter (pp. 146), specific statistical models along with the most parsimonious overall model will be presented further for maternal overprotection, child physical punishment and child sexual abuse.

Table 5.18 Spearman's Correlation coefficients between the continuous exposure variables

Variables	PBI maternal care	PBI paternal care	PBI maternal overprotection	PBI paternal overprotection	Parental attachment
PBI maternal care		.663**	-.660**	-.531**	.489**
PBI paternal care	.663**		-.544**	-.592**	.480**
PBI maternal overprotection	-.660**	-.544**		.730**	-.368**
PBI paternal overprotection	-.531**	-.592**	.730**		-.290**
Parental attachment	.489**	.489**	-.368**	-.290**	

**p<.01

Different possible confounder variables like gender, maternal age, maternal education, ethnicity, family type, changes of parents, averaged family income deciles (1-10 years), or averaged interviewer rating of standard of living (1-10 years) were assessed. Finally, gender, averaged family income deciles and family type were associated either in a positive or a negative way with hospital admission as an outcome variable or exposure variables, and were statistically significant. Table 5.19 presents the statistically significant associations between confounders (gender, family type and family income deciles) and hospital admission.

Table 5.19 Univariate logistic regressions analyzing the association between confounder variables and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Gender	.686	.130	.000	1.987	1.538	2.565
Family type	-.922	.262	.000	.398	.238	.664
Average family income deciles	-.082	.031	.009	.921	.866	.979

The potential role of different variables as mediators was analyzed next. The ones which will be potentially used in the final models are presented in Table 5.20.

Table 5.20 Univariate logistic regressions analyzing the association between mediator variables and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Family conflict	.227	.071	.001	1.255	1.093	1.441
Deviant peer affiliation	.129	.027	.000	1.137	1.079	1.199
Novelty seeking behavior	.028	.013	.033	1.029	1.002	1.056
Child neuroticism	.049	.017	.005	1.050	1.015	1.087
Self-esteem	-.032	.011	.003	.969	.948	.989
Major depression	.555	.154	.000	1.741	1.286	2.357
Suicide ideation	.699	.180	.000	.554	1.414	2.859
Alcohol abuse	.299	.161	.063	1.348	.983	1.848
Drug use	.477	.194	.014	1.610	1.100	2.357

Gender specific logistic regression models for hospital admission

The final regression models were created separately for males and females, because as presented earlier in this thesis (Chapter 2), the literature suggests males and females could be affected differently by their relations with one or both parents, and by environmental factors. On gender specific models, child sexual abuse was not statistically significant, therefore only models based on maternal overprotection and child physical punishment will be discussed further.

The gender-exposure variables interaction models are presented below (Tables 5.21-5.24). In all the exposure variables/gender interaction models if the interaction terms would be removed, the -2log likelihoods would increase significantly showing a worse fit as shown in Table 5.25, therefore the interaction models improve the overall fit.

In conclusion, separate models for males and females will be presented further.

Table 5.21 Multivariate logistic regression analyzing the association between PBI maternal overprotection, gender, and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
PBI maternal overprotection	**.027**	**.011**	**.012**	**1.028**	**1.006**	**1.049**
Gender	**.690**	**.139**	**.000**	**1.993**	**1.519**	**2.615**

Table 5.22 Multivariate logistic regression analyzing the association between PBI maternal overprotection, gender, interaction, and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Lower
PBI maternal overprotection	.001	.018	.961	1.001	.967	1.036
Gender	.362	.219	.098	1.437	.935	2.207
Interaction	**.043**	**.022**	**.057**	**1.044**	**.999**	**1.091**

Table 5.23 Multivariate logistic regression analyzing the association between child physical punishment, gender, and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Lower
Child physical punishment	**.555**	**.167**	**.001**	**1.743**	**1.255**	**2.420**
Gender	**.714**	**.132**	**.000**	**2.041**	**1.576**	**2.644**

Table 5.24 Multivariate logistic regression analyzing the association between child physical punishment, gender, interaction, and hospital admission

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Lower
Child physical punishment	.102	.241	.670	1.108	.691	1.776
Gender	**.540**	**.145**	**.000**	**1.717**	**1.291**	**2.282**
Interaction	**.946**	**.349**	**.007**	**2.575**	**1.299**	**5.105**

Table 5.25 Changes in -2Log Likelihood in interaction models

Interaction between gender and:	Change in -2Log Likelihood	P value
PBI maternal overprotection	**3.688**	**.055**
Child physical punishment	**7.583**	**.006**

Males

The univariate logistic regression models for males showed the variables in Table 5.26 as being statistically significant.

Table 5.26 Univariate logistic regressions analyzing the association between exposure, confounder, and mediator variables, and hospital admission (Males)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Family type	**-.947**	**.373**	**.011**	**.388**	**.187**	**.806**
Deviant peer affiliations	**.089**	**.040**	**.024**	**1.093**	**1.012**	**1.181**
Novelty seeking behaviour	**.041**	**.020**	**.046**	**1.042**	**1.001**	**1.084**
Suicide ideation	**.578**	**.287**	**.044**	**1.782**	**1.015**	**3.129**
Alcohol abuse	**.622**	**.226**	**.006**	**1.863**	**1.197**	**2.899**
Drug use	**.581**	**.252**	**.021**	**1.789**	**1.092**	**2.930**

Table 5.26, which presents the univariate analyses statistically significant results, shows that none of the exposure variable influence boys hospital

admission in young adulthood, therefore an overall stepwise logistic regression model was created based on family type, deviant peer affiliations, novelty seeking behaviour, suicide ideation, alcohol abuse and drug use (Table 5.27).

Table 5.27 Multivariate logistic regression for hospital admission (Males)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Alcohol abuse	**.607**	**.237**	**.010**	**1.835**	**1.154**	**2.917**

In the final multivariate model, the variable that seemed to influence the hospital admission for males was alcohol abuse in the teens' years.

Females

The univariate logistic regression models for females showed the variables in Table 5.28 as being statistically significant, so separate models for maternal overprotection and child physical punishment will be presented further along with the overall most parsimonious model.

The highest hospital admission ORs were for females who suffered physical punishment in childhood and also who suffered from major depression, suicide ideation and used drugs between the age of 16 and 18.

Table 5.28 Univariate logistic regressions analyzing the association between exposure, confounder, and mediator variables, and hospital admission (Females)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
PBI maternal overprotection	**.044**	**.014**	**.002**	**1.045**	**1.016**	**1.074**
Child physical punishment	**1.048**	**.253**	**.000**	**2.853**	**1.738**	**4.684**
Family type	**-.927**	**.378**	**.014**	**.396**	**.189**	**.829**
Average family income deciles	**-.091**	**.043**	**.035**	**.913**	**.839**	**.994**
Family conflict	**.280**	**.100**	**.005**	**1.323**	**1.087**	**1.611**
Deviant peer affiliations	**.157**	**.039**	**.000**	**1.170**	**1.085**	**1.262**
Self-esteem	**-.031**	**.014**	**.029**	**.970**	**.943**	**.997**
Major depression	**.562**	**.196**	**.004**	**1.754**	**1.195**	**2.573**
Suicide ideation	**.681**	**.237**	**.004**	**1.975**	**1.242**	**3.141**
Drug use	**.765**	**.337**	**.023**	**2.150**	**1.110**	**4.165**

In Table 5.29 maternal overprotection was used as exposure variable in the stepwise multivariate model, which showed that maternal overprotection, deviant peer affiliation, and suicide ideation were statistically significant while family conflict was borderline. The hospital admission ORs (2.236 for 95%CI = 1.278-3.914) for girls with suicide ideation were double the ORs (1.037 for 95%CI = 1.005-1.069) for girls with parents exhibiting over control tendencies or who were engaged in deviant peer affiliations (1.120 for 95%CI = 1.278-3.914).

Table 5.29 Multivariate logistic regression analyzing the association between PBI maternal overprotection, other variables, and hospital admission (Females)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
PBI maternal overprotection	**.036**	**.016**	**.021**	**1.037**	**1.005**	**1.069**
Family conflict	.181	.103	.079	1.198	.979	1.466
Deviant peer affiliations	**.113**	**.043**	**.009**	**1.120**	**1.029**	**1.220**
Suicide ideation	**.805**	**.285**	**.005**	**2.236**	**1.278**	**3.914**

Table 5.30 presents the same analyses for child physical punishment and shows that along child physical punishment, deviant peer affiliations and suicide ideation were again statistically significant, with the highest hospital admission OR for child physical punishment (2.483 for 95%CI = 1.369-4.506).

Table 5.30 Multivariate logistic regression analyzing the association between child physical punishment, other variables, and hospital admission (Females)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Child physical punishment	**.910**	**.304**	**.003**	**2.483**	**1.369**	**4.506**
Deviant peer affiliations	**.134**	**.042**	**.001**	**1.143**	**1.053**	**1.242**
Suicide ideation	**.784**	**.281**	**.005**	**2.191**	**1.262**	**3.803**

Table 5.31 presents the overall most parsimonious model where both maternal overprotection and child physical punishment were introduced as exposure variables, and shows the same effects as the previous two models, with exposure variables and mediator variables (deviant peer affiliations and suicide ideation) statistically significant. It looks again that females who suffered from physical abuse in childhood or suicide ideation in adolescence were twice likely to be admitted to hospital compared with females who were overprotected in childhood or had deviant peer affiliations in adolescence.

Table 5.31 Multivariate logistic regression analyzing the association between PBI maternal overprotection, child physical punishment, other variables, and hospital admission (Females)

Variable	B	S.E.	P value	OR	95.0% C.I. OR	
					Lower	Upper
Child physical punishment	**.916**	**.313**	**.003**	**2.500**	**1.355**	**4.614**
PBI maternal overprotection	**.031**	**.016**	**.049**	**1.032**	**1.000**	**1.065**
Deviant peer affiliations	**.112**	**.043**	**.010**	**1.119**	**1.028**	**1.218**
Suicide ideation	**.788**	**.288**	**.006**	**2.200**	**1.252**	**3.865**

In conclusion, the following models were computed for hospital admission:

1. Model 1 unadjusted univariate logistic regressions: maternal and paternal care and overprotection, parental attachment, child physical punishment and child sexual abuse were statistically significant associated with hospital admission, as presented in Table 5.17.

2. Model 2 univariate logistic regressions for males: maternal overprotection, physical punishment, or child sexual abuse did not influence boys' hospital admission in young adulthood (Table 5.23).

3. Model 3 multivariate logistic regression for males: only alcohol abuse was statistically significant associated with hospital admission as presented in Table 5.27. The model explained 2.1% of variance (R^2 = .021). The value of R^2 has increased from .018 in the univariate model including only the type of family variable, to .021 in the multivariate model adjusting for family type, deviant peer affiliations, novelty seeking behaviour, suicide ideation, alcohol abuse and drug use.

4. Model 4 looked at the association between maternal overprotection and hospital admission adjusting for confounder and mediator variables for females: the model was statistically significant for maternal overprotection, deviant peer affiliations, and suicide ideation, with 10.9% of variance explained by the model (Table 5.29; R^2 = .109). The value of R^2 has increased from .029 in the univariate model including only the exposure variable, to .054 in the multivariate model adjusting for confounders like family type, family conflict and average family income deciles, and to .109 in the overall model including mediators.

5. Model 5 looked at the association between child physical punishment and

hospital admission adjusting for confounder and mediator variables for females: the model was statistically significant for child physical punishment, deviant peer affiliations, and suicide ideation, with 11.1% of variance explained by the model (Table 5.30; $R^2 = .111$). The value of R^2 has decreased from .046 in the univariate model including only the exposure variable, to .045 in the multivariate model adjusting for confounders like family type, family conflict and average family income deciles, and increased to .111 in the overall model including mediators.

6. Model 6 looked at the association between both exposure variables: maternal overprotection and child physical punishment and hospital admission, adjusting for confounder and mediator variables for females: the model was statistically significant for maternal overprotection, child physical punishment, deviant peer affiliations, and suicide ideation, with 12.6% of variance explained by the model (Table 5.31; $R^2 = .126$). The value of R^2 has increased from .064 in the multivariate model including only the exposure variables, to .074 in the model adjusting for confounders like family type, family conflict and average family income deciles, and to .126 in the overall model including mediators.

5.6.3b Poisson regression models for the number of visits to the general practitioner or to a hospital during the last year as outcome variable

The number of visits to the general practitioner or to a hospital outcome variable was a count variable not normally distributed, and for these reasons, Poisson regression models were computed in order to analyse the relationship between this variable and the exposure variables.

The exposure variables, along with the confounder and mediator variables which were statistically significant in the univariate Poisson regression models are presented in Table 5.32.

Table 5.32 Univariate Poisson regressions analyzing the association between exposure, confounder and mediator variables, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B)	
					Lower	Upper
PBI maternal care	-.010	.002	-5.26	.000	-.015	-.007
PBI paternal care	-.010	.002	-6.58	.000	-.014	-.008
PBI maternal overprotection	.013	.002	6.83	.000	.009	.017
PBI paternal overprotection	.008	.002	4.13	.000	.004	.012
Parental attachment	-.010	.001	-8.19	.000	-.013	-.008
Child physical punishment	.273	.029	9.25	.000	.216	.331
Child sexual abuse	.368	.031	11.97	.000	.308	.428
Gender	.434	.025	17.20	.000	.385	.484
Family type	-.195	.047	-4.15	.000	-.287	-.103
Average family income deciles	.023	.006	3.82	.000	.011	.035
Interparental violence	.090	.025	3.60	.000	.041	.139
Deviant peer affiliations	.030	.005	5.92	.000	.020	.040
Neuroticism	.029	.003	9.46	.000	.023	.035
Self-esteem	-.021	.002	-10.91	.000	-.025	-.017
Major depression	.276	.028	9.90	.000	.221	.331
Anxiety	.284	.030	9.43	.000	.225	.343
Suicide ideation	.306	.032	9.60	.000	.243	.368
Alcohol abuse	.281	.029	9.67	.000	.224	.338

Given the presented colinearity between the continuous exposure variables (Table 5.18), and the values of the coefficients in the univariate Poisson regression models (Table 5.32), maternal overprotection was chosen as exposure variable along with the dichotomous variables represented by child physical punishment and child sexual abuse.

Gender specific Poisson regression models for the number of visits to the general practitioner or to a hospital during the last year

Similarly to the logistic regression models, an interaction effect was found between gender and exposure variables with all the Likelihood ratio test values statistically significant, and this is presented in Tables 5.33-5.39.

Table 5.33 Multivariate Poisson regression analyzing the association between PBI maternal overprotection, gender, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B) Lower	Upper
PBI maternal overprotection	.011	.002	5.66	.000	.007	.015
Gender	.402	.026	15.24	.000	.350	.453

Table 5.34 Multivariate Poisson regression analyzing the association between PBI maternal overprotection, gender, interaction, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B) Lower	Lower
Gender	.353	.028	12.41	.000	.297	.409
Interaction	.006	.001	5.72	.000	.004	.008

Table 5.35 Multivariate Poisson regression analyzing the association between child physical punishment, gender, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B) Lower	Lower
Child physical punishment	.305	.030	10.30	.000	.247	.363
Gender	.448	.025	17.72	.000	.399	.498

Table 5.36 Multivariate Poisson regression analyzing the association between child physical punishment, gender, interaction, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B) Lower	Lower
Gender	.407	.025	15.94	.000	.357	.456
Interaction	.183	.018	10.36	.000	.148	.218

Table 5.37 Multivariate Poisson regression analyzing the association between child sexual abuse, gender, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B)	
					Lower	Upper
Child sexual abuse	.239	.032	7.51	.000	.176	.301
Gender	.388	.026	14.87	.000	.337	.440

Table 5.38 Multivariate Poisson regression analyzing the association between child sexual abuse, gender, interaction, and doctor visits

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B)	
					Lower	Upper
Gender	.376	.027	14.11	.000	.324	.428
Interaction	.129	.017	7.62	.000	.096	.162

Table 5.39 Interaction models

Interaction between gender and:	Likelihood ratio test	P value
PBI maternal overprotection	283.70	.000
Child physical punishment	404.34	.000
Child sexual abuse	359.81	.000

Gender specific Poisson regression models for the number of visits to the general practitioner or to a hospital during the last year will be presented further.

Poisson regression models including exposure, confounder, and mediator variables

IRRs were calculated by exponentiating the Poisson regression coefficients for the final regression models which included mediators.

For both males and females exposure variables like maternal overprotection, child physical punishment and child sexual abuse, confounders like family type and average family income deciles, and mediators like deviant peer affiliations, child personally variables, depression, conduct disorders, suicide ideation and alcohol abuse gave statistically significant IRRs (Tables 5.40-5.48).

In general they show that if for a male or a female, the IRR values will be increased by one point, the rate ratios for the number of doctor visits would be expected to increase by a factor of more than one, while holding all other variables in the model constant.

Males

As it could be seen in Table 5.40, in univariate analyses for males different exposure, confounder and mediator variables were statistically significant.

Table 5.40 Univariate Poisson regressions analyzing the association between exposure, confounder and mediator variables, and doctor visits (Males)

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B)	
					Lower	Upper
PBI maternal overprotection	**.008**	**.004**	**2.36**	**.018**	**.001**	**.015**
Child physical punishment	**.249**	**.047**	**5.33**	**.000**	**.157**	**.340**
Family type	**-.300**	**.074**	**-4.05**	**.000**	**-.446**	**-.155**
Average family income deciles	**-.021**	**.010**	**-2.17**	**.030**	**-.040**	**-.002**
Deviant peer affiliations	**.041**	**.008**	**5.09**	**.000**	**.025**	**.057**
Neuroticism	**.025**	**.006**	**4.32**	**.000**	**.014**	**.036**
Self-esteem	**-.018**	**.004**	**-4.94**	**.000**	**-.025**	**-.011**
Novelty seeking	**.022**	**.004**	**5.30**	**.000**	**.014**	**.030**
Major depression	**-.037**	**.059**	**-0.63**	**.529**	**-.152**	**.078**
Anxiety	**.213**	**.058**	**3.68**	**.000**	**.100**	**.327**
Alcohol abuse	**.358**	**.044**	**8.06**	**.000**	**.271**	**.444**
Suicide ideation	**.345**	**.055**	**6.28**	**.000**	**.237**	**.453**

The IRR for maternal overprotection in the univariate model was 1.008 (95%CI = 1.001-1.015), and marginally changed to 1.009 (95%CI = 1.002-1.1.016) in the multivariate model where adjustments were done for family type and average family income deciles.

In the final model based on maternal overprotection, this exposure variable was not statistically significant, and the model included family type, neuroticism, novelty seeking, alcohol abuse, and suicide ideation (Table 5.41).

Table 5.41 Multivariate Poisson regression analyzing the association between maternal overprotection, confounders and mediators, and doctor visits (Males)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Family type	**.819**	**.068**	**-2.39**	**.000**	**.794**	**.980**
Neuroticism	**1.021**	**.006**	**3.32**	**.001**	**1.008**	**1.033**
Novelty seeking	**1.017**	**.004**	**3.88**	**.000**	**1.008**	**1.025**
Alcohol abuse	**1.207**	**.060**	**3.77**	**.000**	**1.094**	**1.330**
Suicide ideation	**1.362**	**.082**	**5.15**	**.000**	**1.211**	**1.533**

In the univariate model based on child physical punishment the IRR was 1.249 (95%CI = 1.157-1.340); its value was 1.252 (95%CI = 1.141-1.373) in the multivariate model adjusting for confounders like family type and socioeconomic status, and was 1.219 (95%CI = 1.106-1.343) in the final multivariate model where adjustments were done for neuroticism, novelty seeking behaviour, alcohol abuse, and suicide ideation (Table 5.42).

Table 5.42 Multivariate Poisson regression analyzing the association between child physical punishment, confounders and mediators, and doctor visits (Males)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Child physical punishment	1.219	.060	3.99	.000	1.106	1.343
Family type	.839	.070	-2.10	.035	.712	.988
Neuroticism	1.019	.006	3.14	.002	1.007	1.032
Novelty seeking	1.016	.004	3.66	.000	1.007	1.024
Alcohol abuse	1.199	.060	3.64	.000	1.087	1.322
Suicide ideation	1.352	.081	5.03	.000	1.202	1.522

In the final multivariate model including both exposure variables, the IRRs were 1.007 (95%CI = 1.000 -1.014) for maternal overprotection and 1.286 (95%CI = 1.168-1.415) for physical punishment. These values did not change when the confounder variables were introduced (family type and average family income deciles), and only the IRR value for child physical punishment remained statistically significant in the final multivariate model where adjustments were done for mediators (IRR =1.226; 95%CI = 1.113-1.351; Table 5.43).

Table 5.43 Multivariate Poisson regression analyzing the association between maternal overprotection, child physical punishment, confounders and mediators, and doctor visits (Males)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Child physical punishment	1.226	.061	4.13	.000	1.113	1.351
Neuroticism	1.017	.006	2.89	.004	1.006	1.030
Novelty seeking	1.016	.004	3.66	.000	1.007	1.024
Alcohol abuse	1.204	.060	3.74	.000	1.092	1.328
Suicide ideation	1.347	.080	4.96	.000	1.197	1.515

Females

In women's case, a number of ten variables were statistically significant in univariate Poisson regressions (Table 5.44).

Table 5.44 Univariate Poisson regressions analyzing the association between exposure, confounder and mediator variables, and doctor visits (Females)

Variable	B	S.E.	Z	P value	95.0% C.I. EXP(B)	
					Lower	Upper
PBI maternal overprotection	**.012**	**.002**	**5.24**	**.000**	**.008**	**.017**
Child physical punishment	**.344**	**.038**	**8.99**	**.000**	**.269**	**.419**
Sexual abuse	**.257**	**.035**	**7.42**	**.000**	**.189**	**.324**
Family type	**-.117**	**.061**	**-1.92**	**.054**	**-.235**	**.002**
Average family income deciles	**.045**	**.008**	**5.93**	**.000**	**.030**	**.060**
Deviant peer affiliations	**.015**	**.006**	**2.29**	**.022**	**.002**	**.028**
Neuroticism	**.017**	**.004**	**4.35**	**.000**	**.009**	**.024**
Self-esteem	**-.015**	**.002**	**-6.25**	**.000**	**-.019**	**-.010**
Novelty seeking	**-.007**	**.003**	**-2.28**	**.022**	**-.013**	**-.001**
Major depression	**.269**	**.033**	**8.17**	**.000**	**.205**	**.334**
Anxiety	**.211**	**.036**	**5.90**	**.000**	**.141**	**.281**
Conduct disorder	**.378**	**.104**	**3.62**	**.000**	**.173**	**.583**
Alcohol abuse	**.289**	**.039**	**7.49**	**.000**	**.214**	**.365**
Suicide ideation	**.226**	**.039**	**5.78**	**.000**	**.149**	**.303**

The IRR for maternal overprotection was 1.012 (95% CI = 1.008-1.017) in the univariate model (Table 5.44). Adjusting for confounder variables (family type, average family income deciles) in the multivariate model increased the IRR to 1.015 (95% CI = 1.010 -1.019), while adjusting for mediators in the final model (deviant peer affiliations, neuroticism, self-esteem, novelty seeking behaviour, major depression, anxiety, conduct disorders, alcohol abuse, and suicide ideation) marginally decreased the IRR to 1.008 (95% CI = 1.003-1.013; Table 5.45).

Table 5.45 Multivariate Poisson regression analyzing the association between maternal overprotection, confounders and mediators, and doctor visits (Females)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
PBI maternal overprotection	1.008	.003	2.95	.003	1.003	1.013
Family type	.784	.053	-3.61	.000	.687	.895
Average family income deciles	1.069	.009	7.52	.000	1.050	1.087
Novelty seeking	.987	.003	-3.98	.000	.980	.993
Self-esteem	.991	.003	-3.35	.001	.985	.996
Major depression	1.215	.045	5.22	.000	1.129	1.306
Alcohol abuse	1.218	.056	4.31	.000	1.113	1.332

For the models based on child physical punishment, the IRR was 1.344 (95% CI = 1.269-1.419) in the univariate model, increased to 1.471 (95% CI = 1.362-1.588) in the multivariate model that adjusted for confounders, and decreased to 1.366 (95% CI = 1.251-1.491) in the multivariate model that adjusted for both confounders and mediators (Table 5.46).

Table 5.46 Multivariate Poisson regression analyzing the association between child physical punishment, confounders and mediators, and doctor visits (Females)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Child physical punishment	1.366	.061	6.97	.000	1.251	1.491
Family type	.795	.054	-3.39	.001	.697	.908
Average family income deciles	1.078	.010	8.48	.000	1.059	1.096
Novelty seeking	.985	.003	-4.33	.000	.980	.992
Self-esteem	.990	.003	-3.90	.000	.985	.995
Major depression	1.162	.044	3.97	.000	1.079	1.251
Alcohol abuse	1.228	.055	4.58	.000	1.125	1.341

The investigation of the association between child sexual abuse and the number of doctor visits, showed that for females the IRR in the univariate analysis was 1.257 (95% CI = 1.189-1.324), and increased to 1.337

(95% CI = 1.248-1.431) while adjusting for family type and average family income deciles. In the final model were further adjustments were done the IRR was 1.217 (95% CI = 1.129-1.311; Table 5.47).

Table 5.47 Multivariate Poisson regression analyzing the association between child sexual abuse, confounders and mediators, and doctor visits (Females)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Child sexual abuse	**1.217**	**.047**	**5.12**	**.000**	**1.129**	**1.311**
Family type	**.746**	**.049**	**-4.47**	**.000**	**.656**	**.848**
Average family income deciles	**1.067**	**.009**	**7.98**	**.000**	**1.050**	**1.085**
Major depression	**1.210**	**.043**	**5.31**	**.000**	**1.128**	**1.298**
Conduct disorder	**1.254**	**.135**	**2.09**	**.036**	**1.015**	**1.550**
Alcohol abuse	**1.180**	**.049**	**3.95**	**.000**	**1.087**	**1.280**

For the most parsimonious overall model including all the exposure variables, the IRRs were 1.007 (95% CI = 1.003-1.012) for maternal overprotection, 1.287 (95% CI = 1.184-1.401) for child physical punishment, and 1.196 (95% CI = 1.109-1.289) for child sexual abuse. In the confounder adjusted model, they became 1.010 (95% CI = 1.005-1.015) for maternal overprotection, 1.345 (95% CI = 1.235-1.465) for child physical punishment, and 1.221 (95% CI = 1.133-1.316) for child sexual abuse. In the final model that adjusted for the rest of variables, the vales of the IRRs were 1.331 (95% CI = 1.219-1.455) for child physical punishment, and 1.213 (95% CI = 1.118-1.316) for child sexual abuse, while the maternal overprotection variable became statistically not significant (Table 5.48).

Table 5.48 Multivariate Poisson regression analyzing the association between maternal overprotection, child physical punishment, child sexual abuse, confounders and mediators, and doctor visits (Females)

Variable	IRR	S.E.	Z	P value	95.0% C.I.	
					Lower	Upper
Child physical punishment	**1.331**	**.060**	**6.34**	**.000**	**1.219**	**1.455**
Child sexual abuse	**1.213**	**.051**	**4.62**	**.000**	**1.118**	**1.316**
Family type	**.798**	**.054**	**-3.33**	**.001**	**.699**	**.911**
Average family income deciles	**1.076**	**.010**	**8.24**	**.000**	**1.058**	**1.095**
Novelty seeking	**.983**	**.003**	**-4.89**	**.000**	**.977**	**.990**
Self-esteem	**.991**	**.003**	**-3.22**	**.001**	**.986**	**.997**
Major depression	**1.113**	**.044**	**2.72**	**.006**	**1.030**	**1.202**
Alcohol abuse	**1.203**	**.055**	**4.08**	**.000**	**1.101**	**1.315**

In conclusion, the following models were computed for the number of doctor visits:

1. Model 1 univariate Poisson regression models showed that different exposure variables like maternal and paternal care and overprotection, parental attachment, child physical punishment and child sexual abuse, as well as different confounder and mediator variables were statistically significant associated with the number of doctor visits, as presented in Table 5.32.

2. Model 2 univariate Poisson regression models for males: only maternal overprotection and childhood physical punishment influenced the number of visits to the doctor (Table 5.40).

3. Model 3 multivariate Poisson regression model for males, with maternal overprotection as exposure variable: the exposure variable was not statistically significant in the final model which included family type, neuroticism, novelty seeking, alcohol abuse, and suicide ideation as presented in Table 5.41.

The value of R^2 has increased from .002 in the univariate model including

only maternal overprotection, to .031 in the multivariate model adjusting for confounder and mediator variables.

4. Model 4 looked at the association between child physical punishment and the number of doctor visits adjusting for confounder and mediator variables for males: the model was statistically significant for physical punishment family type, neuroticism, novelty seeking behaviour, alcohol abuse, and suicide ideation (Table 5.42). The value of R^2 has increased from .007 in the univariate model including only the exposure variable, to .009 in the multivariate model adjusting for confounders, and to .035 in the overall model including mediators.

5. Model 5 looked at the association between both exposure variables: maternal overprotection and child physical punishment and the number of doctor visits, adjusting for confounder and mediator variables for males: the model was statistically significant for child physical punishment, neuroticism, novelty seeking behaviour, alcohol abuse, and suicide ideation (Table 5.43). The value of R^2 was .009 in the model including only the exposure variables, remained the same in the multivariate model adjusting for confounders, and increased to .034 in the overall model including mediators.

6. Model 6 multivariate Poisson regression model for females, with maternal overprotection as exposure variable: the exposure variable was statistically significant in the final model which also included family type, average family income deciles, novelty seeking behaviour, self-esteem, alcohol abuse, and depression as presented in Table 5.45.

The value of R^2 has increased from .006 in the univariate model including

only maternal overprotection, to .017 in the multivariate model adjusting for confounders, and .035 in the final model.

7. Model 7 multivariate Poisson regression model for females, with child physical punishment as exposure variable: the exposure variable was statistically significant in the final model which also included family type, average family income deciles, novelty seeking behaviour, self-esteem, alcohol abuse, and depression as presented in Table 5.46.

The value of R^2 has increased from .014 in the univariate model including only child physical punishment, to .023 in the multivariate model adjusting for confounders, and .044 in the final model.

8. Model 8 multivariate Poisson regression model for females, with child sexual abuse as exposure variable: the exposure variable was statistically significant in the final model which also included family type, average family income deciles, alcohol abuse, conduct disorders, and depression as presented in Table 5.47.

The value of R^2 has increased from .010 in the univariate model including only child sexual abuse, to .022 in the multivariate model adjusting for confounders, and .037 in the final model.

9. Model 9 multivariate Poisson regression model for females, including maternal overprotection, child physical punishment, and child sexual abuse as exposure variables: the exposure variables were statistically significant in the final model with the exception of maternal overprotection; the model also included family type, average family income deciles, novelty seeking behaviour, self-esteem, alcohol abuse, and depression as presented in Table 5.48.

The value of R^2 has increased from .020 in the model including only the exposure variables, to .035 in the multivariate model adjusting for confounders, and .048 in the final model.

5.6.3c Other regression models for the number of visits to the general practitioner or to a hospital during the last year as outcome variable

For reasons explained earlier in this chapter, the optimal statistical approach for studying the association between the quality of parent-child relationship and the number of doctor visits was considered the Poisson regression. However, a more traditional approach to analyses was initially considered. Firstly, the outcome variable was treated as a continuous variable using linear regression. Secondly, the outcome variable was categorised in four classes: no visits, one visit, two visits, three visits, and four and more than four visits to the doctor, and an ordinal logistic approach was used. However, the results for both the linear regression and ordinal regression models were not statistically significant, probably because treating the outcome variable as a linear or categorical variable resulted in introducing different biases.

5.7 Discussion

5.7.1 Summary of the results

Demographic characteristics of the cohort

The CHDS gender distribution was equal, and overall the participants were born in two parent white-collar families. Most of them left school with a recognized qualification, but only a third obtained a university degree by the age of 25.

The data suggested there were statistically significant tendencies for the obtained samples to under-represent children from socially disadvantaged backgrounds characterized by low maternal education, low socioeconomic status at birth and single parenthood.

The association between the quality of parent-child relationship and health care use outcomes

A summary of the results based on the initial research questions is presented below.

1. What is the nature and strength of the relationship between parent-child relationship and health, specifically, health care utilisation?

Overall there was an association between health care utilisation represented by hospital admission or number of doctor visits and different measures of the quality of parent-child relationship.

The variance explained by different logistic regression models for hospital admission was in the range of 2.1% to 12.6%, with the majority of them explaining more than 10% of the variance. These are acceptable values, especially for those models regarding females' hospital admission.

For hospital admission, ORs for childhood physical punishment ranged between 1.644 and 2.853 in different models. For maternal overprotection they ranged between 1.031 and 1.045.

Confidence intervals were wider for childhood sexual abuse due to the smaller number of respondents who reported this type of abuse. Consequently, although the magnitude of OR was comparable to that of the relationship between childhood physical abuse and hospital admission in univariate analysis, the relationship did not reach statistical significance in stratified by gender

models.

The R^2 values were more modest in the Poisson regression models, suggesting that parenting played a smaller role in determining the number of doctor visits in young adulthood.

In different univariate and multivariate models the IRRs ranged between 1.008 and 1.012 for maternal overprotection, between 1.219 and 1.366 for child physical punishment, and between 1.213 and 1.368 for sexual abuse.

2. What are the relationships in the home which matter (looking at parental-child interaction and abuse)?

Regarding hospital admission, none of the parenting variables were statistically significant for males.

However, for females, maternal overprotection and child physical punishment seemed to confirm an association with hospital admission both in individual models, as well as in an overall more parsimonious model.

Child physical punishment was a more powerful predictor of hospital admission for girls compared to maternal overprotection.

Other parenting variables like maternal care, paternal care and overprotection, or parental attachment where highly correlated with maternal overprotection, and therefore only models based on this component of the PBI were constructed.

Some other aspects of the parent-child relationship described using the HOME Inventory, e.g. maternal emotional responsiveness and maternal avoidance of punishment did not seem to be associated with hospital admission. This was also the case for child sexual abuse, where the small sample size for childhood sexual abuse may explain why many of the ORs were

not statistically significant, especially for males.

The number of doctor visits for boys were associated with maternal overprotection and child physical punishment, with physical abuse predicting a higher number of doctor visits compared with maternal over control.

For girls, the most important predictor for the number of doctor visits was child physical punishment, followed by child sexual abuse and maternal overprotection.

3. Does this relationship differ according to gender?

An interaction effect was found between gender and exposure variables, therefore separate models for males and females were created.

Males and females were similar in regards to physical punishment or maternal overprotection: cohort participants physically abused by their parents or with mother exhibiting an over control behaviour were more likely to pay visits to the doctor.

The relationship between parenting and health care use differed according to gender for child sexual abuse which was a significant predictor only for females' doctor visits.

4. Is this relationship altered by other factors like family functioning, family structure, family socioeconomic status, child's personality or mental health?

A relationship of moderate strength between parenting and health care use was observed even after controlling for different factors. The relationship was not confounded to a significant degree by socioeconomic status, family conflict or family structure.

In regards to hospital admission, the analyses showed that maternal overprotection and child physical punishment had an influence on hospital

admissions for females. The effects of maternal overprotection and physical punishment were marginally affected by mental health (suicide ideation), and deviant peer affiliations.

For males, none of the exposure variables had a statistically significant effect on hospital admission. However, a model based on family type and other variables like deviant peer affiliations, novelty seeking behaviour, suicide ideation, alcohol abuse and drug use was created that showed that only alcohol abuse in adolescence affected the likelihood of hospital admission in later life.

Poisson models were computed for the number of visits to the doctor. Separate models for maternal overprotection, child physical punishment, and child sexual abuse, as well as overall models for males and females determined small modifications in the IRRs. This demonstrates that adjusting for different confounders and mediators added some information but did not replace the effect of the exposure variables on the outcome: the number of doctor visits.

The least effect on the parenting-number of doctor visits relationship was played by family type and child personality measures like self-esteem, neuroticism or novelty seeking behaviour.

A stronger effect was seen for mental health variables (depression, suicide ideation or conduct disorders) and behaviour variables (alcohol abuse).

5.7.2 Importance of the results

The results of the analyses provided evidence that poor parent-child relationships, especially illustrated by child physical punishment and maternal overprotection, were a risk factor for increased health care use in young

adulthood. In the context of the life course theory, I consider these results very important, as potential mechanisms by which poor parenting might influence health in later life include psychosocial pathways mediated via the hypothalamic-adrenal response to stress (Ottaviani & Franceschi, 1996). Also, a causal relationship could be implied as the analyses are based on longitudinal data in which the exposure variables were measured before the outcomes, and the data have been collected over 25 years. The causality aspect will be discussed further in the last chapter of this thesis.

In previous studies the analyses were not necessarily adjusted for confounders or the role of different mediators was not discussed. However, the analyses presented in this thesis adjust for socioeconomic factors, family functioning and structure, and discuss the role of different mediators such as deviant peer relations, neuroticism, self-esteem, novelty seeking behavior and mental health.

In this study adjustment was done for some key confounding factors and in general results could be affected by residual confounding, but based on the previous literature and the exploratory data analysis, it could be implied that in this thesis any residual confounding effect was probably marginal.

It is interesting to see that the socioeconomic factor did not really play an important role in the relationship between parenting and health care use for this cohort. The use of economic adversity as a confounder in these analyses was due to the fact that economic adversity is one of the most studied risks in the larger social environment. It has been considered as a main effect, as a risk whose effect is conferred via impoverished parenting, and as a modifier of other risk processes. The majority of studies concerned with parenting and

child development adopts the second approach and consistently demonstrates that economic adversity operates on children's psychological development by compromising parenting and fostering family distress (DeGarmo, Forgatch, & Martinez, 1999; Sampson & Laub, 1994). This is not to say that economic adversity matters for children's well-being (e.g., rates of delinquency) only because it inhibits adequate parenting. Instead, studies of this sort are important for demonstrating the limitations of measuring only distal indicators of risk (such as economic adversity) without also specifying how they may shape children's adjustment. Accordingly, if, as the above studies suggest, the effects of economic adversity on children's behavioral adjustment are mediated through the quality of parent-child relationships, then it may not be realistic to expect that improving economic conditions will necessarily bring about positive changes in children's behavior. On the other hand, improving parent-child relationships may bring about positive changes in children's behavior even if the family continues to experience significant financial strain.

The findings also suggest that family structure does not have a very powerful effect on health care use, compared with some qualitative aspects of the parent-child relationship that seem to be more linked to health inequalities in adulthood. However, this fact needs to be put into perspective, as the percentage of single parent families in this cohort was quite small (8%).

In these analyses, different factors like health risk behaviour, deviant peer affiliations, child personality and mental health in adolescence seem to marginally mediate the relationship between the quality of parent-child

relationship and physical health in young adulthood assessed by hospital admission or number of visits to the doctor.

The findings of this study indicate that attention should be paid to gender differences in respect to mental health.

Psychological and psychiatric studies indicate that from early childhood onward, females show higher levels of internally directed and withdrawal symptoms, such as neurotic behavior, anxiety, depression, and psychosomatic complaints.

Males, on the other hand, report more external, 'acting-out' conflict-oriented disorders such as aggressive behavior, drug abuse and criminal acts. The results of the study supports previous research, because males were more likely to present suicide ideation, while females were more likely to be diagnosed with depression.

Both genders were equally affected by alcohol abuse in adolescence, and this was also reflected in the Poisson regression models.

Consistent with this study, a number of studies have reported that individuals with poor parenting and childhood abuse engage in more health risk behaviours than individuals with no childhood abuse. Fewer studies have explored whether or not health risk behaviours mediate the relationship between poor parenting and health. For example, researchers from the Adverse Childhood Experiences Study found evidence that health risk behaviours mediated the relationship between adverse childhood experiences and ischemic heart disease (Dong, Giles et al, 2004) and liver disease (Dong, Dube et al, 2003).

Given that changing health habits is difficult (Davis, Combs-Lane & Smith, 2004), it is important to understand how these habits develop and are maintained. In

explaining the relationship between childhood abuse and smoking, Anda and colleagues (1999) suggest that nicotine's psychoactive effects are used to cope with negative emotional, neurobiological and social effects of adverse experiences. They also note that individuals who have experienced adverse childhood experiences suffer from problems with affect, socialization and self-esteem. These problems may increase their susceptibility to peer pressure and tobacco marketing. McKay (1999) in his review found that negative emotional states, cravings, cognitive factors, interpersonal problems and lack of coping effort prior to relapse played a role in relapse to alcohol, drug and nicotine use. The cognitive factors included decreased commitment to abstinence, lower self-efficacy and urge to give up. These factors are more common among individuals with a history of poor parenting and abuse, making it difficult for them to manage these health risk behaviours, which in turn can affect their physical health in later life.

5.7.3 Family functioning and the quality of parent-child relationship measures; their strengths and limitations

Variables reflecting family functioning and the quality of the parent-child relationship were skewed towards good values.

Overall, 44% of the sample members reported some degree of interparental violence. However, the measure of the incidents of physical violence between parents during childhood was not very discriminative; the evidence suggests the need to abandon dichotomous measures and to develop more refined measures that describe the nature and extent of the exposure to violent acts (Fergusson, Horwood, & Lynskey, 1992; Mullen et al, 1993). Family violence leads to child abuse very often. In 1996, more than three million victims of alleged abuse were reported to child protective services

agencies in the United States, and the reports were substantiated in more than one million cases. Parents were the abusers in 77% of the confirmed cases, other relatives in 11%. Sexual abuse was more likely to be committed by males, whereas females were responsible for the majority of neglect cases. More than 1,000 United States children died from abuse in 1996. A 2004 report said that nearly 17% of adult women and 8% of adult men had been abused as children (National Committee to Prevent Child Abuse). The United Nations Children's Fund (UNICEF) reported in early 2004 that nearly 3,500 children younger than age 15 die every year from physical abuse and neglect in the 27 richest nations in the world (UNICEF, 2004).

One aspect of parental abuse that has been the source of considerable public and research attention concerns the use of physical punishment, and particularly the acceptability and consequences of punitive parenting behaviour for children's health and wellbeing (Leach, 1993; Smith & Brooks-Gunn, 1997).

There is considerable evidence to suggest that the use of physical punishment by parents is relatively common, and that a substantial number of children are exposed to parental discipline practices that are sufficient to cause physical injury (Mullen et al, 1996; Wolfner & Gelles, 1993).

Many studies have also found that children from disadvantaged home environments characterised by socioeconomic adversity, single parenthood, social isolation, family stress, and marital conflict are at an increased risk of exposure to abusive physical punishment (McCloskey, Figueredo, & Koss, 1995; Ross, 1996). Researchers have argued that chronic levels of stress are arising because of poverty, unemployment, interparental conflict and

violence that place strains on a parent's care giving abilities, which in turn, increases their susceptibility to problematic parenting practices such as the use of physical punishment methods.

In this sample the majority of the participants reported that their parents never or rarely used physical punishment (82%), boys being more likely than girls to be physically punished (19% vs. 16%). These results are generally similar to international estimates of the use of physical punishment by parents (Straus, 1994). Results from the 1985 National Violence Survey revealed that more than two thirds of American parents used corporal punishment (Straus, 1994).

The retrospective measurement of physical punishment (sample members being interviewed at the age of 18 and 21) has a number of methodological limitations. First, recall bias may vary as a function of child age at the time of abuse exposure. It is also possible that problems associated with selective recall may occur in which current psychological difficulties may lead some individuals to view their childhood more negatively or to feel unwilling to discuss those experiences.

A second limitation of the present study is that given the use of a retrospective measure of child physical punishment, no information was available on the timing or duration of young people's exposure to punishment or abuse.

Child sexual abuse was retrospectively measured as well, so the same methodological limitations could be applied. Overall, 14% of the participants were abused, with more girls than boys (23% vs. 5%) being affected. The figures are quite high (overall, and girls prevalence) and as it was expected,

they mainly affected the females health care use. This relationship was influenced by different mental health aspects, which is in concordance with the findings of Fergusson and colleagues who found that people reporting childhood sexual abuse have increased rates of depression, anxiety, substance abuse, disturbed behaviour or attempted suicide than those not reporting sexual abuse. When confounding factors such as family dysfunction were adjusted for, 10 to 20% of the risk of psychiatric disorder in young adults was accounted for by exposure to child sexual abuse (Fergusson, Horwood, & Lynskey, 1996).

The quality of the parent-child relationship was measured in CHDS by using the HOME Inventory, the Armsden and Greenberg scale of parental attachment, and the Parental Bonding Instrument.

Two subscales of the HOME Inventory were used in the analyses: the maternal emotional responsiveness and the maternal avoidance of punishment and restriction.

HOME Inventory (Caldwell, 1984) is a standard measure of the home environment and mother-child interaction that involves both interviewer observations and maternal report.

Although maternal report has strengths as source of information, it also has limitations. Mothers know their children well and can report on a wide variety of situations, not just the behaviours that are evident during one assessment. A minus to maternal report is its subjective nature. Mothers may be too close to the situation to see some interaction patterns, and social desirability may lead some mothers to over-represent positive qualities.

Observers have actually the advantage of actually seeing, from a more objective perspective, the circumstances of the home and the natural context in which the mother and child are interacting.

In CHDS most of the mothers scored high on the both mentioned subscales of the HOME Inventory.

Bowlby (1979) and Ainsworth (1989) conceptualized parental attachment as providing a secure base that offers the child comfort and security to explore the external environment with confidence. Secure attachment to parents has been found to be positively associated with personal, social, and academic success in college students (Armsden & Greenberg, 1987; Rice et al, 1995). On the other hand, insecure attachment resulting from inconsistent or nonresponsive parenting can lead to anxiety or avoidance of exploring the environment (Lopez & Brennan, 2000).

The Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987) is a 53-item scale based on Bowlby's attachment theory (1979) designed to assess affective and cognitive dimensions of relationships and the quality of attachment of adolescents to parents and peers. In the previously presented descriptive analyses, most of the study participants scored high on the attachment scale (90% had scores between 60-84).

The Parental Bonding Instrument (PBI) was designed as a refined self-report measure of fundamental parental dimensions of care and protection (Parker, Tulping, & Brown, 1979).

In CHDS most of the participants rated their parents positively, towards the highest values on the care scale and lowest values on the overprotection scale.

It is worth mentioning that because the PBI scales were highly correlated between themselves and with parental attachment, only maternal overprotection was finally used to study the association of parent-child relationship with health care utilisation.

In practice exposure variables are often correlated among themselves and with other variables that are not included in the model. If they are highly correlated, important difficulties may occur. An extreme case of colinearity is when the exposure variables are perfectly correlated ($r = 1$), and it is known that when there is perfect correlation among the independent variables, an infinite number of different response functions (with as many different regression coefficients) could fit the data. In this case, any one set of coefficients cannot reliably reflect the true magnitude of effect of the exposure variables on an outcome variable. However, the correlation coefficients in this study were less than .5 and also informal tests were conducted by examining the pair wise correlations, by looking for large changes in the regression coefficients when other independent variables were added and by noting wide confidence intervals for regression coefficients representing important exposure variables. In examining the regression models, the changes in the coefficients and the confidence intervals were not unusual.

In could be also implied that the significant exposure measures in this cohort may not offer an accurate picture of the parent-child relationship through childhood as they were gathered during adolescence (age 16) when conflict tends to increase (e.g. maternal overprotection, child physical punishment). However, they were based on validated inventories with retrospective questions, and they were not likely to reflect only a certain period of time in

that person's life (as for example physical and sexual abuses usually start at earlier ages).

5.7.4 Outcome variables

The outcome variables in this study were represented by hospital admission for physical health problems between the age of 18 and 25 and the number of visits to the general practitioner or the hospital (outpatient centers) during the last year. Overall, women were more likely than men to be admitted to hospital (47% vs. 31%) and this could be due to the inclusion of pregnancy complications or pregnancy terminations in the overall measure for hospital admission. Women were also more likely than men to have more than four visits to the general practitioner or to outpatient centres during the last year (68% vs. 50%).

A presentation of the concept of health and ways of assessing it through disease-specific and generic measures was done in Chapter 2 (pp. 23) and Chapter 3 (pp. 67) of this thesis. Also, different determinants of health care use were discussed in Chapter 2 (pp. 42).

Based on the presented literature it could be said that hospital admission or the numbers of doctor visits could be seen as reasonable proxies for measuring health in a generic way (Andersen, 1995; pp. 48 in Chapter 2). Traditionally, many countries have used hospital admission data, outpatient visits and general practitioner visits as indicators for morbidity.

In general, their strength relies on the fact they are objective observations which are recorded in health care settings. The main limitation comes from the fact they are based on intermittent observation visits, and the simple

recording does not give enough information on the well-being status of the patient.

Although this data provides valuable and widely used information, care is needed in their use and interpretation. For example hospital data reflects not only the underlying prevalence and severity of disease, individual factors and referral practices, but also variations related to provider-specific factors. This includes completeness in the data, supply of hospital beds, admission policies, hospital access and distance from hospital (Lagoe, Arnold, & Littau, 1999). Recording problems could also underestimate the true prevalence of diseases for general practitioner or outpatient visits.

5.7.5 Mental health

There were clear gender differences in the patterning of mental health disorders, with females having higher rates of internalising (mood and anxiety) disorders and males having higher rates of externalising (conduct and substance use) disorders.

The high overall prevalence of the mental health disorders in this cohort are similar to the findings of another New Zealand cohort study, the Dunedin Multidisciplinary Health and Development Study (Feehan et al, 1994), and more generally to the results of research into other similar populations around the world, including studies from the USA or Canada (Offord et al, 1987). This convergence of findings from epidemiological studies of population samples across a number of countries could provide reassurance that the prevalence rates from this study are unlikely to be specific just to the New Zealand Christchurch sample. It is probably an adequate general

estimate of the risk of psychiatric disorders for other New Zealand community samples.

5.7.6 Generalization of the results

The CHDS was not designed to be representative of all young people born in New Zealand in 1977. It was geographically restricted to those born in the Canterbury region in that year. A majority of these subjects were still living in that geographic area at ages 21 and 25. As Fergusson, Horwood, & Lynskey, (1992) specify, the results generated from CHDS data should not necessarily be extrapolated to the general New Zealand population. In particular, the CHDS tended to under-represent Maori and Pacific Islanders populations in New Zealand, as 85% of participants were of European origin.

Also, the attrition rate was quite high, around 21%, and missing data analyses suggested that there were statistically significant tendencies for the obtained samples to under-represent children from socially disadvantaged backgrounds characterized by low maternal education, low socioeconomic status at birth and single parenthood.

Also, the cohort did not exclude babies who were sick or disabled at birth, but measures of parenting and health care use were done at different ages, with the final health care outcomes measured at the age of 25. A reverse causation effect (parenting to be affected by ill health in early childhood and therefore to affect health care use in later life) cannot be entirely excluded, but given the long follow up and the relative rarity of health problems at birth in general Western populations, this would be an unlikely explanation of the results.

5.7.7 Strengths of the study

Critiques of the previous empirical research linking the quality of parent-child relationship with health care use in later life refers to the reliance on cross-sectional studies, insufficient regard for methodological issues such as selection bias, and the absence of alternative hypotheses.

The CHDS overcomes these criticisms. The main strengths of this study are the fact that it has a longitudinal design, the participants were followed up from birth to age 25, and robust measures of parenting and health care utilisation were used.

While previous studies focused on the impact of parenting on families living in poverty or children living in separated or reconstituted families, the results of this thesis are more likely to be applied to white-collar two parent families. As parent-child relationships are likely to be worse in manual-class families, single parent families or children living in care (Brown et al, 1998; Ghate & Daniels, 1997), these results are likely to prove that the effect of poor parenting on ill health in later life is not necessarily confined to those living in poverty.

5.7.8 Limitations of the study

The main limitation is based on the retrospective nature of most of the exposure variables which could introduce recall bias.

Unfortunately, the prospective measures assessing the quality of maternal interaction with the study members at the age of three (HOME Inventory-maternal emotional responsiveness and maternal avoidance of punishment), did not show a statistically significant relationship with the outcome variables.

In conclusion, because of the nature of the analyses carried out, it maybe mistaken

to confer exclusive importance to maternal overprotection, child physical punishment or child sexual abuse as single predictors of health care use in later life. Also, they represent the negative end or extreme cases of parenting, and although they seem to affect the young adults' physical well-being, it cannot be concluded that other dimensions of the parent-child relationship are not important.

In order to avoid colinearity, the analyses focused more on maternal parenting, and this could be a limitation as other research has suggested that the impact of paternal parenting on health is at least as strong as that of maternal parenting (Stewart-Brown, Fletcher, & Wadsworth, 2005).

Also, the study was conducted by a research team in the Department of Psychological Medicine at the Christchurch School of Medicine, New Zealand, who were primarily interested in mental health outcomes in later life. The data on physical health were based only on hospital admission or number of visits to the doctor, and a small number of questions regarding asthma, that were not used in these analyses given the small number of respondents who developed asthma.

5.8 Conclusions

The CHDS examined the predictive value of parenting on health care use in later life. The study suggests that while an association between parent-child relationship and health was found for both males and females, there were some differences across strata.

Understanding the relationship between children and family and environmental factors that influence the type and pattern of health care utilisation is important, since this relationship is often of great interest from a policy perspective.

5.9 Summary

There are very few studies that link childhood conditions with health care use in later life. The majority of these studies are cross-sectional.

However, CHDS overcomes most of the previous research limitations and provides evidence that the quality of parent-child relationship is a determinant of health care use in later life.

Chapter 6

Discussion, Conclusions and Recommendations

6.1 Discussion

6.1.1 Summary of the results

This thesis comprises a systematic review of longitudinal studies published since 2001 and linking the quality of parent-child relationship with physical health in later life, and secondary data analyses on the CHDS.

The studies considered in the systematic review were generally targeted at children who have disclosed abuse or poor relations with one or both parents. Supportive of the association between parent-child relationship and later life physical health were mostly papers on general health relying on self-reports. Non-supportive were studies looking at mortality and rare diseases and relying on official records.

The CHDS is one of few longitudinal studies to investigate the relationship between the quality of parent-child relationship and health care use in young adulthood. The results of the analyses provide evidence that poor parent-child relationships, especially illustrated by maternal overprotection, child physical punishment, and child sexual abuse, are risk factors for an increased health care use in later life. The most powerful predictor was physical punishment and the relationship was gender specific, with stronger effects on girls.

Adjusting for most of the confounders and mediators added some information but did not replace the effect of the exposure variables on the outcomes: hospital admission or the number of doctor visits.

6.1.2 Causality

Although the goal of this thesis was mainly to strengthen the life course epidemiology argument for the quality of the parent-child relationships and health in later life, a causal relationship could be implied.

To clarify the evidence linking the quality of parent-child relationship and health in later life, the findings will be evaluated using the epidemiologic criteria of causal association formulated by Hill (Hill, 1965). These criteria should be considered when discerning between causal and noncausal association (Rothman & Greenland, 1998). These criteria include:

1. Consistency: Is the association consistent when results are replicated in studies using different settings and different methods?
2. Strength: What is the size of the risk as measured by statistical tests?
3. Specificity: Does a single cause produce a specific problem?
4. Dose-response relationship: Do increasing levels of exposure increase the risk?
5. Temporal relationship: Does the exposure precede the problem?
6. Biological plausibility/coherence: Is the association compatible with existing theory and knowledge and currently accepted pathobiological processes?
7. Experiment: Are there some experiments that demonstrate the association?

Consistency

Previous research has found associations between the quality of parent-child relationship and adult health problems or increased health care utilisation. A direct comparison to other studies is difficult since the parent-child relationship and health

outcomes were assessed in different ways.

Research which has considered generic health indicators will be considered first, followed by research with specific health problems, and then finally research with health care utilisation indicators.

This systematic review shows that for studies reporting on health in general, the results were consistently positive.

The association found in this study between poor parenting and abuse and generic health problems (multiple health problems, poor self-rated health, pain that interferes with activities and disability due to physical health problems) is consistent with the results of the previous systematic review and also previous research which was based on different samples.

The previous systematic review by Stewart-Brown and colleagues (2003) found eight studies (e.g. nine papers: Feldman, Fisher, & Seitel, 1997; Gottman, Katz, & Hooven, 1996; Holler & Hurrelmann, 1990; Johnston, Gonzalez, & Campbell, 1987; Pulkkinen 1990; Pulkinnen 1992; Sweeting & West, 1995; Wickrama, Lorenz, & Conger, 1997; Wickrama et al, 1998) that studied the impact of relationships in the home on common symptoms of ill health or on general measure of health. All these studies found some positive results with the exception of Johnston, Gonzalez, & Campbell, 1987 with not very clear results. The stronger methodological studies found more strongly positive results and some studies stratified their results based on the participants' gender (Pulkkinen 1990; Pulkinnen 1992; Sweeting & West, 1995) or parental gender (Feldman, Fisher, & Seitel, 1997).

More recently, Sachs-Ericsson et al (2005), using a population-based sample in the United States, reported an association between childhood abuse and having at

least one medical problem. Based on a health maintenance organization (HMO) sample, Felitti and colleagues (1998) found a relationship between adverse childhood experiences and poor self-rated health. Similarly, a relationship between childhood sexual abuse and poor perceived health was shown by Thompson et al (2002). Davis, Luecken and Zautra (2005), in a meta-analysis from clinical and community samples, found that individuals with childhood abuse reported more pain symptoms than those
with no childhood abuse.

With regard to the relationship between poor parenting and specific health problems or medical conditions, the results of the present systematic review are consistent with some other studies reviewed only in relation to injuries. A comparison made between studies looking at injuries in the previous review by Stewart-Brown and colleagues (2003) and the present systematic review (Chapter 3, pp. 93-94) shows that both this thesis studies, Schwebel and colleagues (2004) and Soubhi, Raina & Kohen (2004), found the quality of the relationship between parent and children very important in preventing injuries.

Less evidence was found in this review for specific health problems. The previous review found only a few studies, some looking at asthma (Askildsen, Watten, Faleide, 1993 which proved that children more at risk of asthma had parents who were least likely to disagree about anything and idealised their own relationship and the relationship with the baby), and some at blood pressure (Clark & Armstead, 2000; Wright et al, 1993 that showed that poor parenting can affect physiological functioning).

The present study results confirm previous findings that respondents with a history of poor parenting and abuse seek health services more frequently.

Most of the literature on health care utilisation is based on cross-sectional research looking at the effects of abuse in later life. Although there are methodological weaknesses in other studies of health care utilisation and abuse, such as clinically based samples and inadequate control of confounders, some have found an association between childhood abuse and the frequency of physician visits (Felitti, 1991), or hospitalisations (Salmon & Calderbank, 1996) .

Strength of association

In the systematic review the strength of the relationship varied from study to study, usually at the level of 5 in 100 or $p<.05$.

The strength of the association between parent-child relationship and adult health care use in the CHDS as assessed by exposure variables' IRRs in multivariate analyses for the number of doctor visits were in the range of 1.007 to 1.252 for males, and 1.008 to 1.471 for females. For hospital admission, the exposure variables' ORs were in the range of 1.032 to 2.853 for females and were comparable to those reported in previous studies (OR of 1.2 in Felitti et al, 1998; OR of 2.2 in McCauley et al, 1997). However, comparing the strength of association found in this study with the results of previous investigations is not easy due to the different statistical and reporting methods used. Variations in the magnitudes of the relationships between studies may depend on how parent-child relationships were defined, how health problems were assessed, how well the study was controlled for confounders and what type of population was included.

Specificity

In reviewing the present findings, no support was found for the notion that poor parent-child relationships affect certain body systems more than others.

In general, all types of childhood adversities are associated with a broad spectrum of negative health outcomes (Edwards et al, 2004). For example, McCauley and colleagues (1997) found that childhood abuse was associated with nightmares, back pain, headaches, pelvic, genital or private area pain, binging and vomiting, frequent tiredness, problems sleeping, abdominal or stomach pain, vaginal discharge, breast pain, choking sensation, loss of appetite, problems urinating, diarrhea, constipation, chest pain, face pain, frequent or serious bruises, and shortness of breath. It was also associated with anxiety, depression and hospitalization for an emotional problem.

The systematic review and CHDS findings are consistent with a growing body of knowledge on the effects of stress. In her review of neurobiological responses to childhood maltreatment, Glaser (2000) concluded that no post-maltreatment syndrome is apparent. McEwen and Seeman (1999) explained that genetic factors and adverse childhood experiences can predispose the individual to overreact physiologically and behaviourally to stressful stimuli. Over time, overexposure to neural, endocrine and immune stress mediators can lead to the development of disease. They write: 'In general the effects of trauma and other childhood adversities are very broad and do not appear to be specific for any one type of psychiatric or other disorder, the breadth and strength of the effects of such trauma is reminiscent of the broad systemic effects of alterations of the responsiveness of physiological mediators that is embodied in the concept of allostatic load' (McEwen & Seeman, 1999, pp. 42).

However, predicting how individuals will be affected by similar experiences is difficult because the neurobiological processes may vary depending on factors such as the nature and the duration of childhood adversities, and the social environment of the child.

Dose-response relationship

Only studies that are based on categorical analyses could establish a dose-response relationship. In general, cross-sectional studies looking at different types of abuse are more likely to find evidence of a dose-response relationship between abuse and ill health. Felliti and colleagues (1998) found that a higher number of adversities was associated with a greater likelihood of reporting health problems. Women reporting multiple types of child maltreatment (physical, sexual, emotional, physical and emotional neglect) were more likely to report problems than women reporting one type of abuse (Walker et al, 1999).

A few studies in the systematic review established a dose-response association between poor parenting and health in later life (Kopec & Sayre, 2004; Pulkki et al, 2003; Stewart-Brown, Fletcher, & Wadsworth, 2005). This could not be properly established for the CHDS due to the dichotomous nature of the hospital admission variable and the count nature of the number of doctor visits.

Temporal relationship

Based on the systematic review inclusion criteria, it could be said that the temporal relationships was fulfilled by all studies, including CHDS, because the putative cause preceded the putative effect in all of them.

Biological plausibility

As previously presented, researchers have suggested that the childhood environment can influence health through biological and psychosocial pathways (Hertzman et al, 2001; Kuh & Ben-Shlomo, 1997; Rutter, 1989). Latent factors, pathway factors and cumulative effects are possible mechanisms which link childhood factors to adulthood (Hertzman et al, 2001). Latent factors adversely affect health independently of other intervening factors, and pathway factors influence health by altering the life trajectories which in turn affect health. Cumulative effects are due to the increased risk of adverse health with the increase in intensity and duration of a risk factor.

As Hertzman and colleagues (2001) remarked, it is difficult to distinguish between latent, pathway factors and cumulative effects. All three mechanisms may be operating in most cases. The neurobiological effect of a poor parent-child relationship could be classified as a latent factor because physiological studies have shown that high stress brought about by abuse or neglect can adversely affect body tissues and organs (McEwen & Seeman, 1999). The details of the physiological effects of adverse environments before adulthood have been studied mostly in animal models where a high degree of experimental control is possible. There is no reason to believe that these physiological mechanisms would work differently in humans. A poor parent-child relationship could be considered a pathway factor due to its negative effects on mental health or risk behaviours which in turn could lead to negative health outcomes. In considering the putative negative effects of poor parent-child relationships, a case could be made for their cumulative effects.

Experiment

Due to ethical issues, no human experiments can be conducted in order to assess the relationship between poor parenting and adverse adult health.

However, a number of animal experiments provide strong evidence for the association between abuse and neglect in early life and long term biological consequences that influence physiological functioning and future behaviour (Coplan et al, 1998; Heim et al, 1997).

Summary of evidence for a causal relationship

Evidence from this thesis satisfies to a high degree five of the seven of Hill's criteria. The studies consistently point to a relationship of moderate strength between poor parent-child relationship and adult health. They also provide evidence for a dose-response relationship and temporality. A growing body of evidence shows how adverse childhood experiences impact biological systems, particularly neurodevelopment, which lead to poor health.

However, less evidence exists to support the specificity and experiment criteria. No evidence was found that poor parent-child relationships lead to specific health problems. Rothman and Greenland (1998) question the validity of the specificity criterion and argue it should not be used to refute a causal relationship. The well-known causal relationship between smoking and health outcomes provides a good example of a cause leading to effects on a wide variety of biological systems. The evidence for experiment is reasonable in animal studies, but could not be proved in human studies, due to ethical reasons.

6.1.3 The relationship between parent-child relationship and health in CHDS

The CHDS found an association between different adverse childhood experiences (maternal overprotection, child physical punishment, and child sexual abuse) and high health care utilisation in young adulthood.

The results suggest that childhood abuse and other aspects of parenting are separate risk factors with individual effects on health care use in later life. For both males and females the strongest effect on health care use was due to physical punishment, followed by sexual abuse and maternal overprotection in females and maternal overprotection in males. The most likely explanation for the decreased influence of child sexual abuse, especially in males, is based on the small number of children affected by this type of abuse in this study.

In general the IRRs for child physical punishment and sexual abuse in models looking at the number of doctor visits were decreased with the addition of maternal overprotection in the model. The attenuated IRRs do not mean that childhood physical punishment and sexual abuse are less important in the presence of other poor parenting measures, but rather that the poor parenting measures also influence long-term health and that they often co-occur with childhood abuse. What appears to be most harmful to health in later life is the accumulation of these adversities, especially for females where the variance explained by the model assessing the relationship between poor parenting, physical punishment and sexual abuse and the number of doctor visits had the highest value.

It is therefore important when assessing a child's environment, to be aware of the many adverse conditions affecting the child's health and development. In practice, childhood abuse is often difficult to identify as families tend to keep it hidden and reported cases represent a small percentage of the actual cases. Assessments and

interventions which focus on socioeconomic status, marital discord, parental psychopathology and parent-child relationships may also be less threatening for families than assessing only their experiences with abuse and neglect. This approach may be helpful in identifying a group of children at risk for negative outcomes.

6.1.4 The relationship between parent-child relationship and health by gender

Most of the systematic review studies have explored whether the association between parent-child relationship and health was gender specific.

The CHDS suggests that while an association between parent-child relationship and health was found for both males and females, there were some differences across strata. The physical health status of women may be more adversely affected by poor parenting than it is for men. For example, the relationship between hospital admission and poor parent-child relationship was present only in females, and also the number of doctor visits was affected more by poor parenting in females. Two explanations for the gender differences may be advanced.

One possible explanation is the fact that women may react differently to poor parent-child relationship comparing to men. Haataunen et al (2003) found an association between adverse childhood experiences and adult hopelessness for women but not for men. The early relationships with the primary caregiver are crucial to the infant's survival, forming expectations about relationships and views of themselves and others.

Another explanation could be in relation to specific aspects of the parent-child relationship that could affect more often women comparing with men, for example, for extreme cases of child sexual abuse which is probably the most damaging trauma comparing with other types of childhood adversities. In this sample, the

percentage of sexually abused children was 14%, with girls being victims more often than boys (23% vs. 5%).

6.1.5 Confounders and mediators

As in the previous review, some of the current systematic review studies adjusted for different confounders and mediators (Belsky et al, 2007; Juon, Ensminger, & Feehan, 2003; Kopec & Sayre, 2004; Pulkki et al, 2003; Raphael, Spatz Widom, & Lange, 2001;Sickel et al, 2002; Soubhi, Raina, & Kohen, 2004; Stewart-Brown, Fletcher, & Wadsworth, 2005; Surtes et al, 2002; Wyman et al, 2007). However, few studies have specifically explored whether or not health risk behaviour mediates the relationship between parenting and health. Researchers from the Adverse Childhood Experiences Study found evidence that health risk behaviours mediate the relationship between adverse childhood experiences and ischemic heart disease (Dong, Giles et al, 2004) and liver disease (Dong, Dube et al, 2003). Both of these studies included all of the health risk behaviours in one model which yielded higher modifications in the odds ratios than modifications found in this study.

The CHDS findings suggest that mental health (e.g. depression, suicide ideation) and health risk behaviours (e.g. alcohol abuse) may have more stronger effects on health than material factors and may be indirectly linked to health inequalities in adulthood.

6.1.6 Strengths and limitations of this thesis

6.1.6a Systematic review: comparing longitudinal studies with other research designs

The systematic review was welcomed by the experts in the field with whom the author was in contact. Most of them were not aware of the previous review and were very pleased to find about it.

The systematic review has different methodological limitations previously mentioned: a low specificity of the search terms, and the inclusion of a diverse range of longitudinal studies, conducted in a variety of settings, reporting a wide assortment of outcome measures, and having diverse quality scores.

When faced with a research question concerning the association between a possible etiologic factor and disease, the epidemiology researcher has to choose an appropriate strategy to resolve the matter. A number of circumstances have to be considered, such as the incidence rate of disease, the time passed between exposure and clinical manifestation of the disease, whether the exposure is associated with only one or more diseases, ethical issues, and funding available for the research, to name a few. In taking such factors into account the investigator may find that other research strategies than cohort methodologies are appropriate.

Numerous questions remain in our understanding of the relationship between poor parent-child relationships and later life. While many of Hill's criteria could be satisfied with the present systematic review, it is possible that more could be learned about causality using alternative research designs.

Case-control studies

While longitudinal designs have advantages in clarifying temporal and causal relationships, there are fewer examples of case-control studies in parenting research.

In general, some advantages of the case-control studies are the fact that they permit the study of rare diseases; they permit the study of diseases with long latency between exposure and manifestation; they can be launched and conducted over relatively short time periods; they are relatively inexpensive as compared to cohort studies; and they can study multiple potential causes of disease.

However, practical and ethical barriers have especially limited the study of children who have experienced poor parenting or abuse. Most of the times it is not possible legally to identify abuse in young children without reporting it to authorities. Reporting triggers a series of interventions that introduces a bias to the study design.

Other disadvantages refer to the fact that information on exposure and past history is primarily based on interview and may be subject to recall bias; the validation of information on exposure is difficult, or incomplete, or even impossible; and the choice of appropriate control group may be difficult.

Cross-sectional studies

Cross-sectional studies are commonly used to study parenting when exposure and disorder are measured at one point in time. Cross-sectional studies are very practical as they may be conducted over a short period of time. This greatly reduces costs and provides information on pressing research questions sooner rather than later. However, due to the cross-sectional design of the study, no definite

conclusions can be made about the causal effect of childhood conditions on physical health in adulthood. Exposure is usually measured retrospectively and may be subject to recall bias.

In conclusion, by enlarging the inclusion criteria for this systematic review, and allowing the introduction of other study designs such as case-control or cross-sectional studies, new information could be added, but their limitations could also affect the findings of the review.

Future research: Intervention studies

Intervention studies could improve our understanding of the link between poor parenting and health. For example, current studies evaluating home visitation programmes aimed at preventing childhood abuse could be explored further, since these studies have tracked child abuse as carefully as possible (Olds et al, 1997). From a population health perspective, more research is needed in understanding the risk factors associated with poor parent-child relationships. Knowing which combinations of factors predict which families are at highest risk for child maltreatment would be helpful in targeting interventions most appropriately. It would also be important to know if addressing these concomitant risk factors would decrease child maltreatment rates.

The research agenda for parenting has recently entered a new phase of evaluating the effectiveness of programmes and professional practices: 'There is a pressing need to integrate basic research aimed at developmental processes with intervention research that assesses efforts to influence developmental outcomes. Such collaborative initiatives hold the promise of advancing both the understanding of the environmental effects on development and also of improving the effectiveness

of early intervention strategies' (pp.13, National Research Council & Institute of Medicine, 2000).

Most existing intervention studies have evaluated programmes in ideal and controlled settings. Furthermore, these evaluations examine one intervention at a time. However, one programme is not likely to be sufficient for many families at risk of maltreating their children. Integrating targeted interventions, community and family supports, child care and health systems may assist families to balance their stressors and supports more effectively. A challenging but essential research plan would be to examine which combinations of intervention programmes and supports are most effective at preventing poor parenting.

6.1.6b Limitations of studies included in the systematic review

The studies included in this systematic review faced different methodological limitations.

Some studies were limited to certain populations (Belsky et al, 2007; Stewart-Brown, Fletcher, Wadsworth, 2005; Wyman et al, 2007), or considered only the maternal relationship with the child (Belsky et al, 2007; Mantymaa et al, 2002; Pulkki et al, 2003).

Others were based on a small number of participants (Juon, Ensminger, & Feehan, 2003; Mantymaa et al, 2002; Romans et al, 2002), had a short follow up (Lester, Stein & Bursch, 2003; Ravaja, Katainen & Keltikangas-Jarvinen, 2001), or had no information on the lost to follow up participants (Pulkki et al, 2003; Raskin White & Spatz Widom, 2003; Romans et al, 2002).

Other methodological drawbacks were the fact that some studies underwent methodological changes before completion (Lester, Stein & Bursch, 2003; Mantymaa et al, 2002), or they did not assess the effect of different

confounder factors (Romans et al, 2002; Surtees et al, 2003); yet others failed to present comprehensive statistical data (p values, CI) unless the results were statistically significant (Kopec & Sayre, 2004).

Regarding the exposure variables, some studies used non-validated measures of the parent-child relationship (Lester, Stein & Bursch, 2003; Stewart-Brown, Fletcher, Wadsworth, 2005). Reliability (the consistency of a set of measurements) and validity (the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure) of data from recollection of childhood are often discussed in the literature (Brewin, Andrews & Gotlib, 1993, Hardt & Rutter, 2004).

Recall bias was the most common limitation of the studies included in this review as poor parenting or abuse was mostly assessed retrospectively (Kopec & Sayre, 2004, Raphael, Spatz Widom, & Lange, 2001; Romans et al, 2002; Surtees et al, 2003). Last (1995) defines recall bias as 'a systemic error due to differences in accuracy or completeness of recall to memory of past events or experiences. For example, a mother whose child has died of leukaemia is more likely than the mother of a healthy living child to remember details of such past experiences as use of X-ray services when the child was in utero (Last, 1995, pp. 141). Reporting bias was also common with some samples which were not necessarily representative for the most extreme cases of abuse or the unreported ones (Sickel et al, 2002; Soubhi, Raina, & Kohen, 2004).

Retrospective data is subject to a variety of limitations. Two errors can be committed which are associated with memory - over reporting and under reporting. Over reporting can occur due to a magnifying effect or a compression of time. For example, the respondent may report having undergone a surgical procedure in the

last 12 months, when in fact it occurred 16 months before (Bradburn, 1985). Under reporting can occur when the information is simply forgotten or the respondent prefers not to report it. Widom & Sheperd (1996) in comparing the accuracy of adult recollection of childhood physical abuse to official records, found a substantial amount (40%) of under reporting. Some of the reasons for under reporting might be embarrassment, wish to protect parents, a concern about perceived stigma, a sense of having deserved abuse, a conscious wish to forget past or a lack of confidence or lack of rapport with the interviewer.

Another common critique of retrospective reporting of childhood events is that the respondent's present psychological state may influence his or her perception of childhood (Bernstein et al, 1994). Some authors suggest that depressed individuals over report adverse childhood experiences. Lloyd & Lishman (1975) noted a retrieval bias in anxious and depressed patients, where they are more likely to remember more negative events and fewer positive ones. However, research evaluating the validity of long term recall suggests that it is reasonably accurate if questions are based on multiple questions, specific behaviours and are free of confusing qualifiers (Kosten, Anton & Rounaville, 1992; Brewin et al, 1993; Hardt & Rutter, 2004). The available evidence on parenting, and especially the extreme cases of abuse and neglect, indicates that when abuse or neglect is retrospectively reported to have taken place, these positive reports are likely to be correct. However, even with well documented cases of abuse or neglect, about a third of individuals do not report its occurrence when specifically asked about it in adult life (Hardt & Rutter, 2004).

6.1.6c Strengths of the CHDS

The CHDS is characterised by several strengths, including the use of a large representative birth cohort of children followed up for 25 years, the availability of a wide range of parental, child and adolescent, and environment risk factors, and the repeated assessment of the participants and their families over the course of childhood and young adulthood.

Going back to the Aday & Andersen (1975) framework of health care use, this study provides evidence that child-rearing practices and parental behaviour are predisposing variables with a clear influence on health care utilisation in later life.

Other studies have shown that sometimes single parents or parents with a low socioeconomic status tend to be more punitive or power assertive (versus reasoning; Fox & Solis-Camara, 1997; McLoyd, 1990; Weinraub & Wolf, 1983). For example, Fox & Solis-Camara (1997) found that Mexican fathers from a lower socioeconomic background had higher scores on a discipline scale. McLoyd (1990) reported that mothers who are poor value obedience more, are less likely to use reasoning, and more likely to use physical punishment as a mean of disciplining and controlling the child. In the case of single mothers, they are less at ease, less spontaneous, and less responsive to their children's communication (Weinraub & Wolf, 1983). However, this study uses a fairly homogenous cohort from a white-collar background, and proves that the negative aspects of parenting, especially maternal overprotection and physical punishment, are not unique to those living in poverty or single parent families.

6.1.6d Limitations of the CHDS

Several limitations of the CHDS analyses could also be discussed. First, the CHDS was not designed to be representative of all young people born in New Zealand in 1977, so caution should be warranted in generalizing these findings to all parenting. Also, as previously noted, the population was fairly homogenous in its socio-demographic characteristics such as family income and ethnicity. Refining or designing parenting measures that are culturally sensitive and account for socioeconomic status would be worthwhile.

The quality of the parent-child relationship was measured in CHDS using retrospective measures such as PBI, the Armsden and Greenberg scale of parental attachment, and self-reports of child abuse, which could have been affected by the disadvantages of retrospective data and recall bias presented earlier in this chapter (pp. 242-243).

Another limitation of the present study is that given the use of a retrospective measure of child physical punishment or child sexual abuse, no information was available on the timing or duration of young people's exposure to punishment or abuse. Also, no discrimination between maternal and paternal parenting could be tracked based on the presented analyses.

One of the study main limitations is the fact that health care use was used as proxy for physical health, because no other generic or specific health measures were available. Hospital admissions and the number of doctor visits have also specific limitations which were discussed in Chapter 5 (pp. 225-226), mainly in relation to provider-specific factors (e.g. completeness in the data, errors due to admission policies and hospital access).

6.2 Overall Conclusion

The findings lend support to the life course model whereby early life events are linked to outcomes later in life. More precisely, both the systematic review and CHDS findings confirm that poor parent-child relationships are associated with later life ill health and increased health care utilisation.

The CHDS overcomes some of the previous studies limitations, but more research is needed in order to fully understand the relationship between poor parenting and health in later life.

6.3 Recommendations

6.3.1 Future research

Further research on parenting

First, systematic effort is needed in order to assess the degree to which findings from observational studies converge with those from experimental ones, especially intervention studies.

Second, links between research designs and the questions being asked need to be made more explicit. Certain designs are useful for addressing some questions but not others. For example, maybe more qualitative research that explores the quality of parent-child relationship is needed; conducting in-depth interviews with adolescents would result in a more complete picture of their relationships with their parents.

Third, there are different theories and methods that assess the quality of parent-child relationship. Researchers should not rely in one method or just a particular approach, because parenting is a complex phenomena and interventions to improve it should be based on high quality research taking into account the diversity and complexity of contemporary families. They

should also think of better ways of assessing prospectively the quality of parent-child relationship through reliable and validated instruments.

Fourth, further research is needed to assess the limits of parenting influence, and the difference between the relationship with the mother and the relationship with the father. In childhood, relationships with the mother may be the most important aspects of the child's life, because the mother is usually the primarily caregiver. However, as individuals go through adolescence, their relationships with their fathers may emerge as an important relationship in their life.

Fifth, a closer integration of animal and human studies of parenting is needed. A number of biologically-based hypotheses suggested from animal research can be investigated in humans, and this research is needed in order to examine whether the use of animal studies for theories of human parenting can be advanced.

Six, more effort is needed to make parenting research more accessible and directly relevant for policy contexts.

Further research on studies linking parent-child relationships with health in later life

Numerous questions remain in our understanding of the relationship between parent-child relationship and health in later life.

First, more in-depth quantitative research is needed, using representative samples, ideally birth cohorts. The validity of the presented theoretical model and its subsequent analyses must therefore be tested in more diverse, larger samples. Working with researchers from established national data sets to

include more parenting, family measures, and health measures in their data collection would be really important.

Researchers should use multiple methods of data collection in order to decrease attrition. Also, in order to decrease biases related to certain methods of data collection, further studies should try to incorporate the use of more independent measures for both exposure and outcome variables (e.g. for physical health not relying on proxy measures such as health care use, for children and adolescents not relying only on parental reports or self-reports of parenting or health, but also on social and health care professionals assessments).

Second, research on both male and females is needed in order to gain a greater understanding about gender differences.

Third, the generalizability of findings across different populations is an important issue. Besides replicating the findings in different socioeconomic and racial or ethnic groups, more evidence is needed in comparing step families with biological families, and also families that adopt high risk children who suffered from negative pre-adoption experiences. Also, maybe more cross-cultural research should be performed. Most studies, including CHDS, have examined parent-child relationships and health in later life primarily from a Caucasian perspective.

Fourth, the aim of this study was to mainly analyse the role of predisposing variables related to family functioning on health care use in later life. Perhaps a more comprehensive study is needed where the impact of parent-child relationships could be analysed and compared with all the other predisposing, enabling and need factors.

6.3.2 Interventions

Long-term health outcomes can be improved by effective interventions that change the balance between risk factors and protective factors in the early childhood environment.

In most of the developed countries parenting is seen as a public health concern. In the United Kingdom, since 1997, there was a change in politics regarding parents and children, especially in regards to eliminating child poverty and developing child preventive and protective services.

Parenting programmes

The British government has also set up non-profit organizations to support parenting like Parenting Education and Support Forum, the Family Welfare Association, the National Children's Bureau or institutions like the National Family and Parenting Institute.

The parenting interventions available in the United Kingdom were classified by Smith (1996) in two categories: those in relations with improving the relationships in the family, and those in relations with improving behaviour, especially children's behaviour. Smith estimated that about 8% of the British parents (especially middle-class White women) were likely in the 1990s to attend a parenting programme. Since then more interventions targeting ethnic groups and low-income families with children zero to three living in the most deprived areas in England have been developed, like Sure-Start. Different recent studies (Scott et al, 2000; Stewart-Brown et al, 2004) and systematic reviews (Gagnon, 2000; Barlow, 1997; Barlow & Coren, 2003; Barlow & Parsons, 2003; Coren & Barlow, 2001) have shown that parenting programmes can be effective across a range of outcome measures.

Knowing more about the mechanisms linking childhood adversities and health in later life would be helpful in developing effective interventions. It would be crucial to know more about which protective factors are at play in developing resilience in children at risk of poor parenting. Do factors such as early intervention programmes, high quality child care, schools and neighbourhoods positively affect the health of individuals who suffered from poor parenting?

Family life educators should also develop parenting programmes that focus on developing and maintaining positive relationships between children and their parents. These programmes should involve not only parents but also their children. Parents need to learn to listen to their child's problems and troubles and to ask their child if something is bothering them. Later on, helping adolescents to deal with the emotions they are experiencing in a positive way should also be addressed. Strong parental support as well as peer support will promote these teens' positive psychological well-being and better social adjustment.

Treatment programmes

There are also available treatment programmes for children and adults who have experienced abuse. Offering services to decrease cognitive, behavioural and psychological effects may lead to improved health outcomes. Interventions for children will be discussed first followed by those for adults.

Most abused children do not receive treatment and those who do, are often not receiving appropriate treatment (Friedrich, 2002). Available treatment modalities for children are derived from attachment, dysregulation and self-perception theories and some have been shown to be helpful in the short-term (Friedrich, 2002). Finkelhor and Berliner (1995) reviewed 29 studies evaluating the effectiveness of

treatments for sexually abused children. All showed that there was improvement but only five studies demonstrated that the improvement was due to the treatment. In a more recent meta-analysis, Showron and Reinemann (2005) examined 21 studies testing the effectiveness of psychological interventions for child maltreatment. These interventions, aimed at abused children or their parents (abusing and non-abusing), had medium effect sizes. Treated participants were better off than 71% of the comparison participants. Improvements were reported in child cognitive processes, self-esteem, anxiety or depression and behaviour as well as parenting attitudes and behaviours and abuse-specific attitudes and behaviours. The health status of individuals who have been abused could also be improved by preventing health risk behaviours. Children, adolescents and adults with many health risk behaviours should be assessed for a history of childhood abuse and this history should be considered in caring for them. While it may be difficult to target large scale health promotion efforts to individuals who have been abused, the efforts could be targeted to populations with increased risk of abuse and other factors putting them at risk of developing poor health habits (e.g. economically disadvantaged families).

Targeting high risk families has been shown to be effective in decreasing health risk behaviours in adolescents in a randomized trial (Olds et al, 1998). Olds and colleagues compared adolescents born to mothers who had participated in a nurse home visitation programme to adolescents in a control group. This intervention consisted of weekly home visits, beginning prenatally to the child's second birthday, to unmarried and socioeconomically disadvantaged women. When these adolescents were interviewed at 15 years old, those born to mothers from the intervention group reported fewer cigarettes smoked each day, fewer days of

having consumed alcohol in the last six months, and fewer lifetime sexual partners than the adolescents from the control group. This nurse home visitation intervention shown its efficacy at decreasing rates of childhood abuse in the intervention families (Olds et al, 1997) and decreasing health risk behaviours (Olds et al, 1998). The increased health risk for adults with childhood abuse indicates that special considerations should be made in treating these individuals. Some studies indicate that interventions aimed at adults, which focus on the psychological aspect of childhood abuse, may have positive effects on physical health (Smyth, 1999). Bremner (2002) argues that since traumatic experiences influence both psychological and physiological functions, practitioners should consider these health aspects in treatment. This approach is echoed by Kendall-Tackett (2004), who recommends that the gap between physical and mental health professionals should be narrowed (Kendall-Tackett, 2004). Mental health professionals should be asking about physical health symptoms and communicating with the general health care system and vice versa. Research indicates that primary health care professionals are generally not comfortable asking about abuse histories, claiming that it disrupts the flow of their intervention (Kendall-Tackett, 2004). There is considerable promise in a primary health care model which supports a team approach, improved access to health care, better co-ordination of health information and a focus on the determinants of health.

Conclusion

In light of this study and previous research, it is clear that behavioural, social and environmental factors work together in the development of long-term health outcomes. These should be considered when developing population health strategies.

The life course approach suggests that these strategies can be directed at multiple points of the life span. However, neuroscience and human development research favour interventions aimed at early childhood because of the rapid brain and behavioural development occurring from birth to age five (Perry, 2002).

There should be a coherent system of support where all parents can obtain assistance in caring for their children. For example, interventions aimed at supporting families with young children have shown important gains in improving the well being of parents, decreasing the development of health risk behaviours, and decreasing the prevalence of antisocial behaviours.

Also, given the importance of preventing child abuse and neglect and the wide range of programmes and strategies available, there is no reason to delay investments in prevention. To help ensure success in new and existing prevention programmes, consideration should be given to:

1. Assessing the current strengths in the public child welfare system and in the communities for preventing child abuse and neglect;
2. Building effective partnerships with important partners in prevention, including community based child abuse prevention programmes, early childhood programmes, schools, health care providers and other relevant entities;
3. Engage parent leaders who have experience using services to strengthen their families as key partners in planning, implementing and evaluating prevention activities;
4. Review national models of prevention programmes and incorporate those that best fit the specific needs and interests.

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Appendix 1

Data Extraction Sheets

Authors/ Title/ Journal	
Their focus of the study	
COHORT DETAILS	
Source	
Age at recruitment	
Sample size at measure of exposure	
Method of recruitment	
Recruitment rate	
Geographic/ Socio-economic group	
Date at start of study.	
FOLLOW UP	
Age at follow up	
Sample size at measure of outcome	
Length of follow up	
Percentage followed up	
Bias/Other	
EXPOSURE	
Confounder/ Other	
OUTCOME	
STATISTIC ANALYSIS	
Analysis details	
RESULTS	
Result details	
Conclusion	
Data	

Authors/ Title/ Journal	**Belsky, J., Bell, B., Bradley, R.H., Stallard, N., & Stewart-Brown, S.L. (2007). Socioeconomic risk, parenting during the preschool years and child health age 6 years. The European Journal of Public Health.**
Their focus of the study	This study tests the hypothesis that some of the effect of socioeconomic risk on health in mid childhood is transmitted via early parenting.
COHORT DETAILS	
Source	Data were collected as part of the common protocol during the first 6 years of the National Institutes of Child Health and Human Development (NICHD) Study of Early Child Care (SECC), a longitudinal study initiated by (NICHD) in 1989 to answer questions about relations between child care experiences and children's development.
Age at recruitment	Mother/child pairs, selected at birth
Sample size at measure of exposure	at 6, 15, 24, 36 and 54 months-1041 mother/child pairs
Method of recruitment	Ten research sites recruited participants from 31 hospitals located in or near Little Rock, AR; Irvine, CA; Lawrence, KS; Wellesley, MA; Philadelphia, PA; Pittsburgh, PA; Morganton, NC; Charlottesville, VA; Seattle, WA and Madison, WI. During the selected 24-h periods in the first 11 months of 1991, all women giving birth were screened for eligibility. Of the 8986 mothers screened, 5416 (60%) were eligible and agreed to a 2-week phone call. A conditionally random sample of 3015 mothers (56%) was selected from these 5416 women, insuring representation (at least 10% marginally) of single parent households, mothers who did not graduate from secondary school, and ethnic minority mothers. These mothers were called (up to 3 times) and 1526 (51%) agreed to a 1-month interview, 1364 of whom completed the interview and became study participants. After exclusion of those with missing data, 1041 of the 1364 subjects were included in the current study.
Recruitment rate	60%
Geographic/ Socio-economic group	This final sample included 52% male and 24% minority ethnic children. 4.5% of the mothers had not completed secondary school, and 14% were lone parents when the child was born. These 1041 participants averaged more years of maternal education (14.49 vs. 14.23) and higher annual family income-to-needs ratios (3.49 vs. 3.40). Included children were less likely to be from lone-parent families (14% vs. 16%) and more likely to be European American (81.2 vs. 79.0%).
Date at start of study.	1991
FOLLOW UP	
Age at follow up	6.6 and 7 years old children

Sample size at measure of outcome	1041 children
Length of follow up	7 years
Percentage followed up	100%
Bias/Other	
EXPOSURE	
	Measures of parenting were drawn from a series of age appropriate, validated, videotaped semi-structured interaction tasks at 6, 15, 24, 36 and 54 months and from the Home Observation for Measurement of the Environment (HOME) Inventory administered at the same ages with the exception of 24 months. During the interaction tasks, mothers were asked to play with their infants for 15 min with and without (6 months only) toys. Videotapes were coded by raters blind to other information about the child/family and inter-coder reliability on 20% of tapes showed intra-class correlations exceeding 0.80 for all measures. The Infant–Toddler version of HOME was used at 6 and 15 months and the Early Childhood version at 36 and 54 months. Average agreement at each site was >0.90 for each time of measurement. Using these data, three measures of parenting (warmth, negativity and positive control) were created by averaging scores across ages on the composite variables as described subsequently. 1. Warmth At 6 and at 15 months warmth was operationalized as the mean of 4-point video ratings (1=not characteristic at all; 4=very characteristic) of sensitivity to the child when not distressed (i.e. supportive of child's goals and desires/not intrusive) and positive regard for the child (i.e. expression of affection and pleasure), and the (7-point) HOME responsivity rating (i.e. appropriateness and timeliness of responsiveness to child bids for attention). At 24 months only (the same) videotape ratings were available for averaging. At 36 and at 54 months a 7-point video rating of nurturing guidance (i.e. emotionally supportive explaining/encouraging) was averaged with the HOME responsivity rating. 2. Negativity At 6 and at 15 months a 4-point video rating of negative regard (e.g. criticism/hostility/annoyance) was averaged with the 4-point HOME harshness rating (i.e. maternal anger/ annoyance/physical punishment). At 24 months only, the video negative regard rating was available. At 36 and at 54 months, a 7-point rating of maternal rejecting behaviour was averaged with the HOME harshness score. 3. Positive control Only one score was available at each of the following ages. At 24 months, positive control was measured by a (reverse scored) 4-point rating of mother's intrusive/overcontrolling behaviour; at 36 months, by a 7-point rating of maternal respect for child's initiatives and ideas; and at 54 months, by the (reverse-scored) HOME harsh control (i.e. dominating) rating.

Confounder /Other	
	The mediator role of the parenting variables was tested: 1. Warmth 2. Negativity 3. Positive control
OUTCOME	
	1. Child general health measure In the fall and spring of first grade when children were 6.6 and 7.0 years of age, respectively, mothers rated the child's overall health using a 4-point scale (1=poor, 2=fair, 3=good, 4=excellent); the two ratings were summed so that higher scores reflected better health (mean: 6.93, SD: 1.07, range: 2–8).
STATISTIC ANALYSIS	
Analysis details	1. Pearson correlations highlighted associations between socioeconomic, parenting and child health variables. 2. Ordinary least-squares regression assessed the predictive power of socioeconomic and parenting variables on health. 3. Hierarchical regression analysis evaluated the degree to which socioeconomic variables collectively predicted child health adjusting for parenting variables. The extent to which parenting variables mediated the impact of socioeconomic variables on child health was tested using the evidentiary standards of mediation proposed by Baron and Kenny.
RESULTS	
Result details	Table 1 presents the bivariate correlations showing that health age 6 years was poorer when families had less income (r=0.15), mothers had less education (r=0.20), were younger (r=0.16) or black (r=0.07). Spouse/partner presence proved unrelated to child health, as was Hispanic or 'other' ethnicity. Health was better in children experiencing more warmth (0.16) and positive control (0.14) and worse when experiencing more negativity (0.14). The level of correlation between SES factors and health, and between parenting variables and health was similar. The three parenting variables were highly correlated (0.58–0.71). Greater income, more years of maternal education, greater maternal age and more occasions residing with a partner predicted better parenting (more warmth/positive control, less negativity). White mothers exhibited more warmth and positive control and less negativity and black mothers the reverse.

Table 1 Pearson correlation coefficients for socioeconomic, parenting and child health variables

	Inc/needs ratio	Mother's education	Mother's age	Partner presence	Hispanic	Black	White	Other	Warmth	Positive control	Negativity	General health
Inc/needs ratio		0.55**	0.46**	0.35**	−0.05	−0.26**	0.23**	0.01	0.45**	0.37**	−0.33**	0.15**
Mother's education			0.52**	0.32**	−0.09**	−0.22**	0.20**	0.06*	0.48**	0.44**	−0.42**	0.20**
Mother's age				0.36**	−0.05	−0.27**	0.25**	−0.01	0.41**	0.35**	−0.38**	0.16**
Partner presence					0.01	−0.41**	0.33**	0.00	0.43**	0.35**	−0.33**	0.04
Hispanic									−0.06	−0.04	−0.02	−0.02
Black									−0.41**	−0.38**	0.31**	−0.07*
White									0.37**	0.35**	−0.25**	0.09**
Other[a]									−0.02	−0.04	0.01	−0.05
Warmth										0.58**	−0.55**	0.16**
Positive control											−0.71**	0.14**
Negativity												−0.14**
General health												

*$P < 0.05$; **$P < 0.01$

a: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups

SES variables were regressed onto the three parenting variables individually and accounted for 39.4, 26.7 and 30.8% of variance in warmth, negativity and positive control, respectively (Table 2).

Income/needs ratio, maternal education, maternal age, partner presence and black and 'other' ethnicity contributed uniquely to the prediction of warmth. Maternal education and age, partner presence and black ethnicity uniquely predicted negativity. Income/needs ratio, maternal education, partner presence and black and 'other' ethnicity uniquely predicted positive control.

Table 2 Impact of SES factors combined on individual parenting variables: showing unstandardized coefficients (B) and standard errors (SE), and standardized coefficients (*B*)

Socioeconomic status	Maternal warmth		Maternal negativity		Positive control	
	B (SE)	*B*	B (SE)	*B*	B (SE)	*B*
Inc/needs ratio	0.082	0.156***	−0.028	−0.048	0.068	0.085*
	(0.016)		(0.020)		(0.026)	
Mother's education	0.112	0.243***	−0.135	−0.258***	0.192	0.273***
	(0.015)		(0.018)		(0.024)	
Mother's age	0.007	0.089**	−0.013	−0.145***	0.007	0.052
	(0.002)		(0.003)		(0.004)	
Partner presence	0.096	0.175***	−0.071	−0.115***	0.098	0.117***
	(0.015)		(0.019)		(0.025)	
Hispanic[a]	−0.097	−0.043	−0.102	−0.040	−0.098	−0.029
	(0.055)		(0.068)		(0.089)	
Black[a]	−0.319	−0.222***	0.245	0.151***	−0.536	−0.245***
	(0.039)		(0.048)		(0.063)	
Other[a,b]	−0.131	−0.048*	0.106	0.035	−0.303	−0.074**
	(0.066)		(0.082)		(0.107)	
R^2	0.394***		0.267***		0.308***	

a: The White group was used as the reference category so was not included in the regression

b: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups

*$P < 0.05$; **$P < 0.01$; ***$P = 0.000$

Table 3 presents the results of regression models for the combined impact of SES variables on child health, (Model 1a), then for the combined impact of parenting variables on child health (Model 1b) and finally for SES and parenting variables combined (Model 2).

SES factors collectively accounted for 5.2% variance in children's health, with maternal education and the 'other' ethnicity making significant unique contributions.

Maternal warmth proved to be the more important independent predictor among the three parenting variables that together accounted for 3.1% of the variance.

	In Model 2, parenting variables did not prove to be significant predictors of child health independent of SES factors; mother's education and 'other' ethnicity remained predictive and a significant effect of partner presence emerged. The ß coefficients for all SES factors other than partner presence (for which an increase was observed) were lower in Model 2 than in Model 1a. The pattern of results was the same in the logistic with child health as a dichotomous outcome (not shown). **Table 3 also presents the level of significance for the change in ß coefficient for each SES variable between Models 1a and 2 using the method of Preacher and Hayes. The change in ßs when parenting variables were included was significant for income-to-needs ratio, mother's education and age, partner presence and black ethnicity. Applying the Sobel test to each parenting variable individually showed the reduction to be largely attributable to the effect of maternal warmth, with no significant changes in ßs due to the inclusion of positive control or negativity.** **Table 3** Impact of SES factors (Model 1a), parenting variables (Model 1b) and SES and parenting variables combined (Model 2) on child health age 6–7 years: showing unstandardized coefficients (B) and standard errors (SE) and standardized coefficients (*B*) and *P*-values for change in *B* between Models 1a and 2. **Predictors** | **Model 1a *B* (SE) Standardized *B*** | **Model 1b *B* (SE) Standardized *B*** | **Model 2 *B* (SE) Standardized *B*** | **Sobel test[c] *P*-value (95% CI)** Income | 0.06 (0.05) 0.05 | | 0.04 (0.05) 0.04 | 0.04 (0.002, 0.04) Mother's eduaction | 0.17 (0.04)*** 0.16 | | 0.14 (0.05)** 0.13 | 0.02 (0.002, 0.02) Mothers age | 0.01 (0.01) 0.06 | | 0.01 (0.05) 0.05 | 0.05 (0.00, 0.105) Partner presence | –0.09 (0.05) –0.07 | | –0.11 (0.05)* –0.08 | 0.02 (0.004, 0.045) Hispanic[a] | –0.03 (0.16) –0.01 | | –0.02 (0.163) –0.004 | 0.66 (–0.06, 0.04) Black[a] | –0.11 (0.12) –0.03 | | –0.04 (0.12) –0.01 | 0.04 (–0.16, –0.06) Other[a,b] | –0.42 (0.19) –0.07* | | –0.39 (0.12)* –0.06 | 0.15 (–0.09, 0.01) ΔR^2 | 0.052*** | | | Warmth | | 0.27 (0.09) 0.11** | 0.16 (0.10) 0.07 | Negativity | | –0.13 (0.09) –0.06 | –0.08 (0.09) –0.04 | Positive control | | 0.04 (0.07) 0.03 | 0.00 (0.07) 0.00 | ΔR^2 | | 0.031*** | 0.058*** | a: The White group was used as the reference category so was not included in the regression b: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups c: 95% confidence intervals and *P*-values for the reduction in ß after adjustment for three parenting variables based on 10 000 bootstrap samples *$P < 0.05$; **$P < 0.01$; ***$P = 0.000$
Conclusion	Parenting mediates some, but not all of the detectable effects of socioeconomic risk on health in childhood (50%). As part of a package of measures that address other determinants, interventions to support parenting are likely to make a useful contribution to reducing childhood inequalities in health.
Data extractors observation	Strengths: 1. The measures of parenting are likely to be robust. No other studies of the impact of parenting on health are based on objective measures made on up to five separate occasions during the pre-school years. Limitations: 1. Whilst our results therefore pertain to the majority of the

	population, they do not cover the most disadvantaged families among whom supportive parenting is likely to be least common. 2. Our findings may also represent a conservative estimate, because they focus only on mothers' parenting and studies examining the impact of parenting on adult health show the paternal relationship to be an independent and, in some studies, more significant predictor than the maternal relationship.
Total quality criteria score	7

Authors/ Title/ Journal	**Juon, H.S., Ensminger, M.E., & Feehan, M. (2003). Childhood adversity and later mortality in an urban African American cohort. American Journal of Public Health.**
Their focus of the study	The aim of the study is to examine family and childhood factors in relation to the risk of later mortality.
COHORT DETAILS	
Source	The Woodlawn project is a longitudinal study of the development of psychological well-being and social adaptation in an epidemiologically defined cohort of African American first graders interviewed as adolescents and again as adults.
Age at recruitment	6-7 years old
Sample size at measure of exposure	1,242
Method of recruitment	The entire population of children beginning first grade in 9 public and 3 parochial elementary schools was entered in the study and assessed. Data were obtained from children's teacher and mother when the children were 6 years old, and from study participants themselves at ages 16-17 years and 32-34 years.
Recruitment rate	
Geographic/ Socio-economic group	Woodland is a poor, ethnically homogenous community on Chicago's South Side.
Date at start of study.	1966-1967
FOLLOW UP	
Age at follow up	18-32 years old
Sample size at measure of outcome	1,091
Length of follow up	Until 1979-1993: between 12 and 27 years
Percentage followed up	(1,091/1,242) * 100=87.84%
Bias/Other	
EXPOSURE	
	1. Family type (mother and second adult, mother alone, mother absent but family member as caregiver and foster). 2. Frequency of corporal punishment as a child (infrequent, measured as never to once a week, or frequent, measured as a few times a week or almost every day).
Confounder/ Other	
	Confounders: 1. Gender

	2. Childhood behavior 3. Mental health 4. Frequency of residential moves
OUTCOME	
	1. Death Death-information was obtained from family members, neighbours and the National Death Index (NDI) records: 1979-1993. For the positive matches they obtained the death certificates from the state, with the cause of death.
STATISTIC ANALYSIS	
Analysis details	1. Multivariate logistic regression
RESULTS	

Result details	

TABLE 1—Population Characteristics in a Prospective Study of Childhood Adversity and Mortality Among 1242 African Americans

Characteristic	No. (%)
Gender	
Female	636 (51.2)
Male	606 (48.8)
Family type	
Mother and second adult	699 (56.3)
Mother alone	459 (37.0)
Mother absent (family member as caregiver)	61 (4.9)
Foster	23 (1.9)
Frequency of residential moves before 1966	
0-2	730 (58.9)
≥3	510 (41.1)
Receipt of welfare in 1966	
No	844 (68.0)
Yes	398 (32.0)
Corporal punishment in 1966	
Infrequent (never to once a week)	745 (60.1)
Frequent (a few times a week or almost every day)	495 (39.9)
Shy and aggressive behavior (teacher's report)	
Neither	646 (52.2)
Shy only	202 (16.3)
Aggressive only	211 (17.0)
Both shy and aggressive	179 (14.5)
Ratings by child's mother on Mother's Symptom Inventory[a,b]	

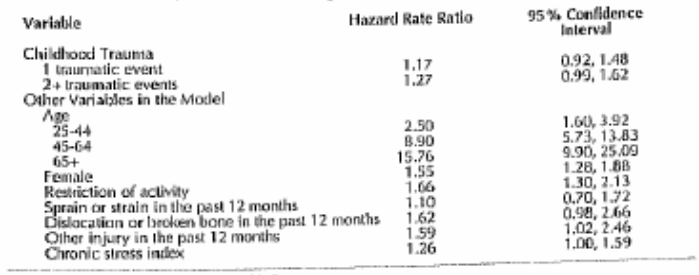
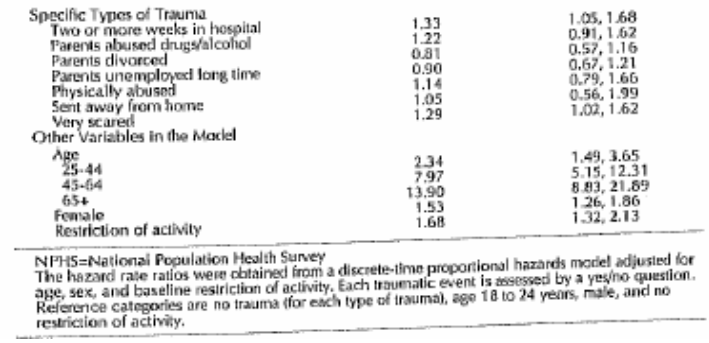
[a] A 38-item mental health inventory adapted from an instrument developed by Connors.[7,12]
[b] Mean ± SD (range) = 9.86 ± 7.52 (0-95).

	TABLE 2—Predictors of Mortality Among 1091 Participants in a Prospective Study: Childhood Individual and Family Characteristics Characterisitic | Adjusted Odds Ratio | 95% Confidence Interval Gender Female[a] | 1.00 Male | 2.62 | 1.31, 5.24** Childhood adversity Family type Mother and second adult[a] | 1.00 Mother alone | 1.82 | 0.93, 3.59* Mother absent (family member caregiver) | 0.78 | 0.10, 6.16 Foster | 16.87 | 5.10, 55.78** Frequency of residential moves before 1966 0-2[a] | 1.00 ≥3 | 1.62 | 0.84, 3.13 Corporal punishment in 1966 Infrequent (never to once a week)[a] | 1.00 Frequent (a few times a week or almost every day) | 1.12 | 0.60, 2.12 Childhood behavior and mental health Shy/aggressive behavior (teacher's report) Neither[a] | 1.00 Shy only | 0.81 | 0.32, 2.04 Aggressive only | 1.25 | 0.43, 3.60 Both shy and aggressive | 1.44 | 0.54, 3.82 Ratings by child's mother on Mother's Symptom Inventory | 1.02 | 0.98, 1.06 [a]Reference category. [b]A 38-item mental health inventory adapted from an instrument developed by Connors.[7,12] *P<.10; **P<.05 **26-year mortality rate for 44 deaths out of 1,091 cohort members who were followed-up=3.5% with (95% CI=2.6, 5.0).** 35 deaths occurred between adolescent and adult assessments and 5 deaths occurred before adolescence. Cause of death: 23% homicide, 9% suicide, 7% AIDS-related illnesses, 7% drug overdose, 11% accidents, 23% various diseases such as cardiac arrest and sickle cell disease, and 20% no information. **After adjusting for the other variables just being a male (OR=2.62 and 95% CI=1.31, 5.24) and being in foster care (OR=16.87 and 95% CI=5.10, 55.78) were statistically significant.**
Conclusion	**There is a considerable risk of early death (32 years old and younger) for persons who have been in foster care; parent-child relationships do not seem to be related with early death.**
Data extractors observation	Question to answer: Is foster care responsible for or plays a causal role in these deaths or being in foster care reflect adverse situations in the family of origin? Limitations: 1. The study's results are based on small numbers.

Total quality criteria score	7

Authors/ Title/ Journal	**Kopec, J.A., & Sayre, E.C. (2004). Traumatic experiences in childhood and the risk of arthritis. Canadian Journal of Public Health.**
Their focus of the study	The purpose of the study was to determine if traumatic experiences in childhood are associated with an increased risk of self-reported arthritis in later life.
COHORT DETAILS	
Source	First 3 cycles of the National Population Health Survey (NPHS) in Canada. The NPHS collects information about the health of the Canadian population every two years. It covers households and institutional residents in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas.
Age at recruitment	18 years old or above
Sample size at measure of exposure	9,159 persons
Method of recruitment	They used longitudinal data from the first 3 cycles of the NPHS in Canada conducted in 1994/1995, 1996/1997, 1998/1999. A representative sample of 19,600 households was drawn and one household member was randomly selected for participation. The participants who were 18 years of age or older and free of arthritis or rheumatism at baseline were selected for the study.
Recruitment rate	(9,159/14,117) * 100=64.88%
Geographic/ Socio-economic group	General population of Canada, residents in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas.
Date at start of study.	1994
FOLLOW UP	
Age at follow up	22 years old or above
Sample size at measure of outcome	9,012 in 1996/1997 and 8,848 in 1998/1999
Length of follow up	4 years
Percentage followed up	Response rate: 98.4% in 1996/1997 and 96.6% in 1998/1999.
Bias/Other	
EXPOSURE	
	1. Child abuse Childhood trauma was assessed at baseline by seven yes/no questions asking about negative experiences that happened when the respondent was a child or a teenager, such as parents divorced, physically abused, sent away from home, being scared “so much you thought about it for years after”. They created a 3-level summary index: 0 traumatic events,

	1 traumatic event, and 2+ traumatic events.
Confounder/ Other	
	Confounders: 1. Demographic and socio-economic (age, sex, education, income adequacy, living arrangements, marital status, race, working status) 2. Anthropometric (weight, height) 3. Behavioral (alcohol, smoking, gardening/yard work, exercise/recreation, pattern of daily physical activity) 4. Health status (self-related health, restriction of activity) 5. Psychological measures (depression, mental distress, chronics stress, personal stress, life events) 6. Injury in the past 12 months 7. Hormone replacement therapy Modifiers: 1. Sex 2. Socio-economic status (income and education) 3. Baseline self-rated health
OUTCOME	
	1. Self-reported arthritis or rheumatism diagnosed by a health professional and defined as lasted or expected to last at least 6 months.
STATISTIC ANALYSIS	
Analysis details	Multivariate analyses using a discrete-time proportional hazards model. Under the assumption of constant hazards within each 2-year cycle, they fitted the complementary log-log transformation of the probability of incident arthritis as a linear function of the covariate using maximum likelihood methods for binary outcomes. The expected time of an event was assumed to be the mid point of the interval.
RESULTS	

Result details	TABLE II Incidence of Arthritis/Rheumatism Among NPHS Respondents 18 Years of Age and Older  NPHS=National Population Health Survey Incidence rates are weighted to represent the Canadian population. TABLE III Effect of the Number of Childhood Traumatic Events and Confounding Variables on the Incidence of Arthritis/Rheumatism Among NPHS Respondents 18 years of Age and Older  NPHS=National Population Health Survey The hazard rate ratios were obtained from a discrete-time proportional hazards model adjusted for age, sex, baseline restriction of activity, injury in the past 12 months, and chronic stress index. Each traumatic event is assessed by a yes/no question. Reference categories are no trauma, age 18 to 24 years, male, no restriction of activity, and no injury in the past 12 months. The hazard ratio for chronic stress index is calculated for a change of 50 points, e.g., from 25 to 75 on the 0-100 index. TABLE IV Effects of Specific Childhood Traumatic Events and Confounding Variables on the Incidence of Arthritis/Rheumatism Among NPHS Respondents 18 Years of Age and Older  NPHS=National Population Health Survey The hazard rate ratios were obtained from a discrete-time proportional hazards model adjusted for age, sex, and baseline restriction of activity. Each traumatic event is assessed by a yes/no question. Reference categories are no trauma (for each type of trauma), age 18 to 24 years, male, and no restriction of activity. **1,006 new cases of arthritis were reported during the 4-year follow-up with an incidence rate of 27.1 per 1,000 person-years, 21.4 among males and 33.0 among females.** **Persons reporting two or more traumatic events were more likely to develop arthritis than persons who did not experience any trauma (RR=1.27 and 95% CI=0.99, 1.62 with a borderline significance for the p value).** **The RR for physically abused children=1.14 and 95% CI=0.79-1.66, for sent away from home=1.05 and 95% CI=0.56-1.99, and very scared=1.29 with 95% CI=1.02-1.62.** **Just two types of trauma, prolonged hospitalization (RR=1.33, 95%CI=1.05-1.68 and being very scared (RR=1.29 with 95% CI=1.02-1.62) showed independent, significant results.**

Population Group	Incidence per 1000 Person-years
All	27.05
Males	21.35
Females	32.97
Age	
18-24	5.35
25-44	14.21
45-64	46.25
65+	84.86

Variable	Hazard Rate Ratio	95% Confidence Interval
Childhood Trauma		
1 traumatic event	1.17	0.92, 1.48
2+ traumatic events	1.27	0.99, 1.62
Other Variables in the Model		
Age		
25-44	2.50	1.60, 3.92
45-64	8.90	5.73, 13.83
65+	15.76	9.90, 25.09
Female	1.55	1.28, 1.88
Restriction of activity	1.66	1.30, 2.13
Sprain or strain in the past 12 months	1.10	0.70, 1.72
Dislocation or broken bone in the past 12 months	1.62	0.98, 2.66
Other injury in the past 12 months	1.59	1.02, 2.46
Chronic stress index	1.26	1.00, 1.59

Variable	Hazard Rate Ratio	95% Confidence Interval
Specific Types of Trauma		
Two or more weeks in hospital	1.33	1.05, 1.68
Parents abused drugs/alcohol	1.22	0.91, 1.62
Parents divorced	0.81	0.57, 1.16
Parents unemployed long time	0.90	0.67, 1.21
Physically abused	1.14	0.79, 1.66
Sent away from home	1.05	0.56, 1.99
Very scared	1.29	1.02, 1.62
Other Variables in the Model		
Age		
25-44	2.34	1.49, 3.65
45-64	7.97	5.15, 12.31
65+	13.90	8.83, 21.89
Female	1.53	1.26, 1.86
Restriction of activity	1.68	1.32, 2.13

	In subgroups analyses, no significant interactions were found between trauma and gender, socio-economic status, or baseline health.
Conclusion	Three was a “moderate” increase in the risk of arthritis among persons reporting multiple traumatic experiences in childhood.
Data extractors observation	Limitations: 1. New cases of arthritis were ascertained through self-report. 2. Recall bias for childhood traumatic events. 3. Arthritis is a generic term including a number of diseases. 4. Sexual abuse was not assessed in NPHS. 5. p-values are not presented in the paper, just mentioned when the results are statistically significant.
Total quality criteria score	2

Authors/ Title/ Journal	**Lester, P., Stein, J.A., & Bursch, B. (2003). Developmental predictors of somatic symptoms in adolescents of parents with HIV: a 12-month follow-up. Developmental and Behavioral Pediatrics.**
Their focus of the study	Predictors of adolescent somatic symptoms in the setting of parental HIV illness, a 12 month follow-up.
COHORT DETAILS	
Source	New York City Division of AIDS services (DAS)-Patients with HIV/AIDS (PWH)
Age at recruitment	Mean Age of adolescents=14.9 (SD=2; Range: 11-18)
Sample size at measure of exposure	255 PHW and one child of the PWH-255 adolescents
Method of recruitment	PHW were selected between August 1993-March 1995 from a consecutive series of clients registered with DAS; PWH were eligible if they were 25-70 years old, and had at least one adolescent child between 11-18 years old; 429 eligible PWH, 307 recruited (71.6%); 409 adolescents were recruited from the final number of 255 PWH (because 65 were untraceable; 46 refused participation; 11 had severe illness or incarceration; 25 did not have custody of the child; 27 did not allow the child to participate);finally, 211 adolescents and 211 PWH were reassessed and available for the study.
Recruitment rate	71.6% (307/429 PWH) and 84.3% of traceable PWH (307/364)
Geographic/ Socio-economic group	High-risk community sample: patients with HIV/AIDS (PWH)-New York City Division of AIDS services (DAS) and one of their adolescents children
Date at start of study.	1995
FOLLOW UP	
Age at follow up	12-19 years old
Sample size at measure of outcome	211 PHW and one child of the PWH-211 adolescents
Length of follow up	12 months
Percentage followed up	82.7%
Bias/Other	
EXPOSURE	
	1. Parental bonding-PBI; the overprotection-independence dimension was not related to adolescent somatisation, so it was not included in the model as predictor; the six rejection items (coef. x=0.80) were summed for a rejection variable; the six care items (coef. x=0.80) were reverse-scored an then summed for a care variable. 2. Child sexual abuse was reported by adolescents participants (1=occurred, 0=not), and defined as unwanted sexual contact, from

	sexual touching, sexual exposure, and oral, vaginal or anal sex; the perpetrator was not specified and the variable was not significantly associated with the outcome variable, so it was not included in the final model as predictor.
Confounder/ Other	
	Information on 10 latent and measured variables is given; other variables such as parent HIV illness stage, parental death, child sexual abuse, and numbers of medical diagnoses were included in preliminary analyses but they were not significantly associated with the final outcome, so they were not included in the final model as predictors; these analyses are not presented in the paper.
OUTCOME	
	1. Somatic symptoms at baseline and at 12 months were assessed with the average somatisation subscale score of the Brief Symptom Inventory (internal consistency coef=0.80 and test-retest reliability=0.68); it contains 7 items (coef. X=0.79 at baseline and x=0.83 at follow-up).
STATISTIC ANALYSIS	
Analysis details	1. Confirmatory factor analysis-the factor loadings of 10 latent and measured variables are presented (also means, SD and x coefficients for the 10 variables); the fit statistics was acceptable: Maximum likelihood (ML) X^2(170, n=211)=190.73; Comparative Fit Index (CFI)=0.98; Root mean square error of approximation (RMSEA)=0.024. 2. Longitudinal Structural Equation Model had a very good fit statistics: ML X^2(200, n=211)=213.52; CFI=0.99; RMSEA=0.018.
RESULTS	
Result details	**Adolescents who experienced their parents as highly rejecting reported more somatic symptoms at follow-up (p<0.001).** **Female adolescents reported more somatic symptoms at baseline and 12 months follow-up (p<0.05).** School problems correlated with somatic symptoms (p<0.001) as well as parental rejection (p<0.001), at baseline. **Parental distress over pain predicted adolescents somatic symptoms at baseline and follow-up (p<0.001).** **The overall rate of somatic complaints at 12 months follow-up was not elevated.** **The lack of relationship between reported child sexual abuse (6% of cohort) and somatic symptoms.**
Conclusion	The study shows that: 1. Adolescents who experienced their parents as highly rejecting and uncaring were more likely to report more somatic symptoms at follow-up. 2. Female adolescents reported more somatic symptoms at baseline and 12 months follow-up. 3. Parental distress over pain predicted adolescents' somatic symptoms at baseline and follow-up. 4. School problems, as well as parental rejection, were found to correlate with somatic symptoms at baseline, but not at follow-up.
Data extractors observation	Limitations: 1. Short follow-up. 2. Other variables such as parent HIV illness stage, parental death, child sexual abuse, and numbers of medical diagnoses were included in preliminary analyses that are not presented in the paper. 3. Method of assessing Parental bonding not validated (used derived

	version). 4. Perpetrator not specified for child sexual abuse. 5. The study was initially designed as an intervention.
Total quality criteria score	3

Authors/ Title/ Journal	**Mäntymaa, M., Puura, K., Luoma, I., Salmelin, R., Davis, H., Tsiantis, J., Ispanovic-Radojkovic, V., Paradisiotou, A., & Tamminen, T. (2002). Infant-mother interaction as a predictor of child's chronic health problems. Child: Care, Health and Development .**
Their focus of the study	The aim of the study was to investigate the impact of the quality of early mother–infant interaction on the subsequent physical health of the child.
COHORT DETAILS	
Source	Families were drawn from normal population, from well-baby clinics in the city of Tampere, Finland. Finnish sub-sample of European Early Promotion Project (EPP).
Age at recruitment	Infants (full-term): 8-11 weeks old
Sample size at measure of exposure	165 mothers and babies
Method of recruitment	Fifty-seven mother-infant dyads from middle and upper class families at risk of psychosocial problems and 63 from non-risk families, altogether 120 dyads, participated in the study. Families were drawn from normal population, from well-baby clinics in the city of Tampere, Finland, invited into the study during pregnancy by public health nurses.
Recruitment rate	
Geographic/ Socio-economic group	Families were drawn from normal population, from well-baby clinics in the city of Tampere, Finland. Infants were full-term and healthy, families with severe risks like psychotic illnesses of the parents or a history of child protection concerns were excluded from the study.
Date at start of study.	
FOLLOW UP	
Age at follow up	2 years old
Sample size at measure of outcome	120
Length of follow up	2 years
Percentage followed up	
Bias/Other	
EXPOSURE	
	1. The Global Rating Scale for Mother–Infant Interactions. Mothers were interviewed when the infants were 4–10 weeks of age. The interview was semi-structured and designed for the EEPP to elicit information on the characteristics of the infant and the family, infant's and parents' health, psychosocial stressors and family functioning. Mother–infant interactions were videotaped when the infants were 8–11 weeks of age. The video recording took place either at home or in a laboratory when the infant was alert and not hungry. The interaction was assessed using the Global Rating Scale for Mother–Infant

	Interactions. In this procedure, a mother and her infant interact face-to-face for five minutes without using toys. The video recording captures the full-face image of the infant, the infant's upper limbs and trunk, and through a mirror placed adjacent to the infant, also the mother's full-face reflection. Six dimensions, each consisting of 3–5 items, are scored: three maternal dimensions to describe the mother's behavior, two infant dimensions to describe the infant's behavior and an interaction dimension to describe how the mother and the baby and their actions fit together. Each item is scored on a five-point-scale from 1 (poor) to 5 (good). The lowest 15% of the mean scores on each dimension (the lowest and the highest 15% for mother's intrusiveness or remoteness and infant's inertness or fretfulness) is regarded as representing poor interaction; good interaction refers to the remaining portion.
Confounder/ Other	
OUTCOME	
	1. Chronic health problems. When the child was two years old, the initial interview was repeated but modified for the age of the child. As a part of this interview the physical health of the child during the past two years and the number and the reasons of the child's visits to GPs or specialists were elicited. If the mother reported none or only a few occasions of minor illness (like common cold, isolated ear infections) the child was considered to have no health problems (NHP group). If the mother reported chronic or recurrent illnesses like recurring infections or severe allergy or asthma causing major restrictions to the child's diet or environment, or other long-term problems requiring regular medication, rehabilitation and/or visits to a doctor, the child was considered to have chronic health problems (CHP group). If the mother reported a serious, possibly life-threatening illness requiring hospitalization (like meningitis or sepsis) but with no chronic or long-term problems the child was considered to have serious health problems. Thus, the group division was based on the mother's report on and perception of the child's health. The children with serious health problems were excluded from this study, because on the basis of the literature it was not expected that poor mother–infant interaction would be associated with serious health problems of this sort.
STATISTIC ANALYSIS	
Analysis details	1. Descriptive statistics 2. Logistic regression
RESULTS	
Result details	The majority of the children (n=96) had no health problems (NHP group) and one-fifth (n=24) were reported by their mothers to have recurrent or chronic health problems (CHP group). Most of them (n=22) suffered from recurring infections, asthma and/or allergy, or both. **Children in the CHP group had visited GPs and specialists significantly more often than healthy children during the two-year**

	follow-up; 83% of them had visited a doctor over 10 times, compared to 8% of the NHP group (p< 0.001). They were more likely already to have had problems by the time the initial interview took place. They had also attended day care centers significantly more often than healthy children and were more likely to have had two or more day care places. **Neither the socio-economic status of the family nor the physical health of the parents was related to chronic or recurrent health problems of the child. However, psychiatric problems in the mother were significantly more common in the CHP group and there was also a similar trend for mental health problems in the father.** **A significantly larger proportion of the CHP group had had poor dyadic mother infant interaction compared to the NHP group (p=0.034). This association remained significant even when the children attending day care centers (n=44) were analyzed separately; 40% (6/15) of the CHP group at day care centers had had poor dyadic mother infant interaction, compared to 10% (3/29) of healthy children attending day care centers (p=0.044).** The quality of mother–infant interaction and the choice of day care system were not related.
Conclusion	The study shows that: In multivariate modelling infant's poor interactive behaviour remained in the model as a significant predictor of child's health problems but poor dyadic mother infant interaction was removed from the model. This may be explained by the strong correlation between infant's interactive behaviour and dyadic interaction. It reflects the important role the infant has in mother infant interaction.
Data extractors observation	Limitations: 1. Small sample size. 2. Group division (NHP/CHP) based on self-report (mother) only. 3. The study was initially designed as an intervention but finally the intervention and the control groups were assessed as one.
Total quality criteria score	0

Authors/ Title/ Journal	**Pulkki, L., Keltikangas-Jarvinen, L., Ravaja, N., & Viikari, J. (2003). Child-rearing attitudes and cardiovascular risk among children: moderating influence of parental socioeconomic status. Preventive Medicine.**
Their focus of the study	The aim of the study was to examine the associations between parental socioeconomic status (SES) and hostile maternal child-rearing attitudes and the insulin resistance syndrome (IRS) precursors in children.
COHORT DETAILS	
Source	Cardiovascular Risk in Young Finns study (CRYF)
Age at recruitment	3 years old
Sample size at measure of exposure	194 children (85 boys and 109 girls)
Method of recruitment	210 randomly selected boys and girls who participated in the epidemiological CRYF study; the subjects of the CRYF study were 3 596 healthy Finnish children randomly selected from 360 rural and 360 urban girls and boys in the age cohorts of 3, 6, 9, 12, 15, and 18 years in 1980.
Recruitment rate	(194/720) * 100=27%
Geographic/ Socio-economic group	Healthy Finnish children aged 3 in 1980 (had to have both parents present in the family).
Date at start of study.	1980
FOLLOW UP	
Age at follow up	6 and 9 years old
Sample size at measure of outcome	210 children (90 boys and 120 girls) at 3–year follow-up 202 children (88 boys and 114 girls) at 6–year follow-up
Length of follow up	3 and 6 years
Percentage followed up	Not stated.
Bias/Other	
EXPOSURE	
	1. Self-rated hostile maternal child-rearing attitudes measured when children were 6 years old-scale from the Operation Family study. This scale consists of nine items measured on a 5-point scale. The items assess three dimensions of hostile child-rearing: (a) the child's low emotional significance to the mother (e.g., "The child is significant to me," 1 _ very significant, 5 _ not significant, (b) the strict disciplinary style of the mother (e.g., "Disciplinary actions are regularly needed," 1 _ totally disagree, 5 _ totally agree), and (c) the mother's low tolerance toward the child (e.g., "In difficult situations, the child is a burden," 1 _ totally disagree, 5 _ totally agree). These three dimensions closely

	correspond to the elements of a constellation that Schaefer has named "hostile child-rearing practice," which includes the mother's emotional rejection of the child and the mother's perception of the child as burdensome and in need of strict disciplinary actions.
Confounder/ Other	
	Mediators: 1. SES
OUTCOME	
	Physiological measurements conducted when children were 3, 6 ,and 9 years old: 1. Serum insulin 2. High-density lipoprotein cholesterol (Serum HDL-C) 3. Triglycerides (Serum TG) 4. Systolic blood pressure (SBP) 5. Body mass index
STATISTIC ANALYSIS	
Analysis details	1. Descriptive statistics 2. Component analysis (Pearson's correlations) 3. Regression analysis
RESULTS	
Result details	**TABLE 3** Pearson's *r* Correlations between IRS, Hostile Maternal Child-Rearing Attitudes, and Parental SES for Boys (above Diagonal) and Girls (below Diagonal)

Variable	1	2	3	4	5	6	7	8
1. Year 0 IRS	—	0.39***	0.29**	−0.10	0.04	0.03	0.11	−0.28**
2. Year 3 IRS	0.44***	—	0.70***	0.05	0.12	0.20	−0.21	−0.15
3. Year 6 IRS	0.27**	0.74***	—	0.15	0.10	0.29**	−0.02	−0.19
4. Hostile child-rearing	0.07	−0.16	−0.10	—	0.83***	0.72***	0.74***	−0.07
5. Low significance	0.09	−0.13	−0.08	0.77***	—	0.40***	0.40***	−0.07
6. Strict discipline	0.06	0.00	−0.03	0.65***	0.23	—	0.35**	−0.12
7. Low tolerance	0.00	−0.19	−0.10	0.80***	0.35***	0.41**	—	0.02
8. Parental SES	0.07	0.05	0.02	0.16	0.04	0.03	0.26**	—

Note. IRS, insulin resistance syndrome precursors factor; SES, socioeconomic status. *N* ranges between 85 and 90 for boys and between 109 and 120 for girls.
** $P < 0.01$.
*** $P < 0.001$.

TABLE 4
Interaction of Hostile Maternal Child-Rearing Attitudes with Parental SES in Predicting IRS among Girls

Variable	β	R^2	Change in R^2	F	df
IRS year 0					
SES	0.027		0.005	0.885	1,107
Hostile child-rearing	0.019		0.004	0.694	1,106
SES × Hostile child-rearing	−0.020*	0.047	0.039	4.284*	1,105
IRS year 3					
SES	0.035		0.002	2.289	1,118
Hostile child-rearing	−0.033		0.029	2.588	1,117
SES × Hostile child-rearing	−0.031***	0.139	0.107	14.417***	1,116
IRS year 6					
SES	0.016		0.000	0.689	1,112
Hostile child-rearing	−0.019		0.010	0.702	1,111
SES × Hostile child-rearing	−0.026**	0.087	0.076	9.150**	1,110

Note. IRS, insulin resistance syndrome precursors factor; SES, socioeconomic status.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

The results showed that parental SES and hostile maternal child-rearing attitudes were differentially related to the IRS precursors among Finnish boys and girls.

Among boys, low parental SES and strict maternal discipline

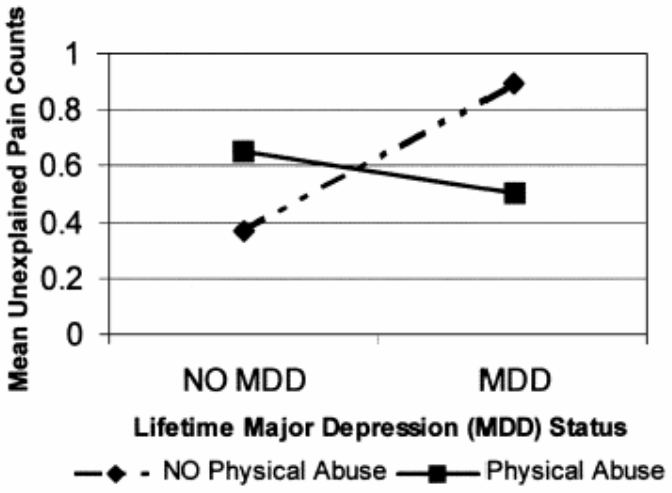
	were independently associated with heightened somatic risk. **Among girls, the health effect of hostile maternal attitudes depended on the family's SES: in a low-SES family, hostile mothering was associated with heightened somatic risk, while in a high- SES family, hostile mothering was associated with lower somatic risk. Thus, a high-SES environment seemed to protect the girls against the adverse health effects of parental hostility.**
Conclusion	Parental SES and hostile maternal child-rearing attitudes were differentially related to the IRS precursors among Finnish boys and girls.
Data extractors observation	Limitations: 1. Mother's self-reports in assessing child-rearing attitudes. 2. There were measures only for mothers, not for fathers. 3. Child had to have both parents (potentially excluded mot vulnerable groups). 4. Lack of data on non-respondents.
Total quality criteria score	1

Authors/ Title/ Journal	**Raphael, K.G., Spatz Widom, C., & Lange, G. (2001). Childhood victimization and pain in adulthood: a prospective investigation. Pain.**
Their focus of the study	The objective of the current study was to determine whether childhood victimization increases risk for adult pain complaints, using prospective information from documented cases of child abuse and neglect.
COHORT DETAILS	
Source	The data employed in these analyses are part of a research project based on a cohort design study (Leventhal, 1982; Schulsinger et al., 1981) in which abused and neglected children were matched with non-abused and non-neglected children and followed prospectively into young adulthood.
Age at recruitment	Children less than 12 years old
Sample size at measure of exposure	1,575 (908 abused and neglected cases and 667 controls).
Method of recruitment	Cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during the years 1967 through 1971. Only court substantiated cases of child abuse and neglect were included in this study. A control group was established with children who were matched on age, sex, race, and approximate family social class during the time period of the study (1967-1971).
Recruitment rate	
Geographic/ Socio-economic group	
Date at start of study.	
FOLLOW UP	
Age at follow up	18-40 years old
Sample size at measure of outcome	1,196
Length of follow up	Follow-up: 1989 and 1995; approximately 20 years.
Percentage followed up	76%
Bias/Other	Recall bias for the retrospective self-reported childhood victimization.
EXPOSURE	
	1. Documented child abuse and neglect Physical abuse cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury.

	Sexual abuse charges varied from relatively non-specific charges of `assault and battery with intent to gratify sexual desires' to more specific charges of `fondling or touching in an obscene manner', sodomy, rape, incest, and so forth. Neglect cases reflected a judgment that the parents' deficiencies in child care were beyond those found acceptable by community and professional standards at the time. These cases represented extreme failure to provide adequate food, clothing, shelter, and medical attention to children. Cases of `involuntary' neglect due to factors such as temporary institutionalization of the legal guardian or failure to pay child support were excluded from the neglect sample. Those children who were adopted as an infant were also excluded from the documented abuse group, because name changes and moves from the county or state made impossible to trace them. 2. Self-reports of childhood victimization experiences obtained during interviews in young adulthood. This variable is defined as reporting any of three types of childhood victimization experiences and includes childhood physical abuse, sexual abuse and neglect. A. Respondents were considered to have self-reported childhood sexual abuse if they met one of three criteria: a) Respondents were first presented with a list of explicitly sexual behaviors (ranging from `an invitation or request to do something sexual' to `another person fondling you in a sexual way' to `intercourse') and asked: `Up to the time you finished elementary school (before 6th grade), did you ever have any of the following experiences...?' This was followed by the question: `Do you consider any of these experiences to have been sexual abuse?' This response constituted the first criterion for self-reported childhood sexual abuse, representing the person's cognitive appraisal (or definition) of the event or experience as being childhood sexual abuse. Thus, the first criterion was based on two parts of the respondent's answer: first, a report of having any of these sexual experiences before age 12 and then a positive response to the follow-up question about abuse. b) Respondents were also asked a separate set of questions about whether they had `ever had a sexual experience with anyone 10 years older' and how old they were when this happened for the first time. A cutoff of age 12 was used to define childhood sexual abuse. Responses to these questions formed the basis for the second criteria for self-reported childhood sexual abuse. If the person reported having had a sexual experience with a person 10 years older, prior to the age of 12, they were considered to have self-reported childhood sexual abuse. c) The third criterion was a positive answer to the question: `Has anyone ever bothered you sexually or tried to have sex with you against your will?' This question was followed-up by a question about the age at which this occurred. This measure of childhood sexual abuse was again restricted to events that occurred before age 12. B. Self-reported childhood physical abuse. This was assessed

	through the use of two different measures. a) The first measure is the `Very Severe Violence' subscale of the Conflict Tactics Scale (CTS). In the present study, CTS items were framed in the context of an introduction which asked respondents about `...things that your parents or the people in your family might have done when they had a disagreement with you when you were growing up, that is, up to the time you finished elementary school'. The Very Severe Violence subscale of the CTS includes the following items: (1) kick, bite, or hit you with a fist; (2) beat you up; (3) burn or scald you; (4) threaten you with a knife or gun; or (5) use a knife or gun. Response categories included never, once, twice, sometimes, frequently, or most of the time, and were collapsed to create a dichotomous variable of `ever' or `never' (comparable to the official designation of abuse/neglect). b) A second measure was designed to provide an alternative means to retrospectively assess childhood physical abuse (self-report of child abuse ± physical; SRCAP). Respondents were asked, `Up to the time you finished elementary school, did anyone either inside or outside of your family ever' (1) beat or really hurt you by hitting you with a bare hand or fist; (2) beat or hit you with something hard like a stick or baseball bat; (3) injure you with a knife, shoot you with a gun, or use another weapon against you; (4) hurt you badly enough so that you needed a doctor or other medical treatment; (5) physically injure you so that you were admitted to a hospital. Respondents were also asked, `Did either of your parents ever beat you when you didn't deserve it?'  C. Self-reported childhood neglect. This is defined by a positive response to any one of three items: (1) `Were there ever times when you were a young child that a neighbor fed you or cared for you because your parents didn't get around to shopping for food or cooking, or when neighbors or relatives kept you overnight because no one was taking care of you at home?' (2) `When you were a young child, did anyone ever say that you weren't being given enough to eat, or kept clean enough, or that you weren't getting enough medical care when it was needed?' (3) `When you were a very young child, did your parents ever leave you home alone while they were out shopping or doing something else?'
Confounder/ Other	
	Confounders: 1. Sex 2. Race (White Non-Hispanic versus Other) 3. Age at the time of follow-up interview 4. Welfare as a child (to control for socio-economic disadvantages)
OUTCOME	
	To assess the frequency of current pain complaints, items from the Somatization module of the Diagnostic Interview Schedule III-R (DIS-III-R) were used. 1. Pain symptom counts. Basic counts of pain symptom complaints were derived by summing the number of positive responses to questions about: Have you ever had abdominal or belly pain, back pain, pain in the joints, pain in arms or legs, chest pains, headaches, pain when you urinated, burning pain around private parts, and pain anywhere else. The following items were preceded by the phrase: `Have you ever had a

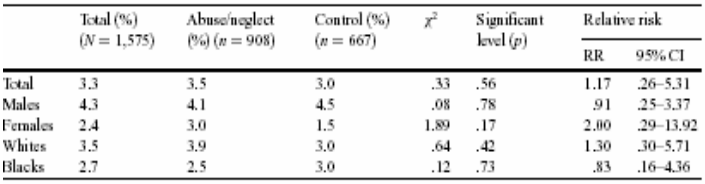
	lot of trouble with...': abdominal or belly pain, back pain, headaches. 2. Pain problem counts. The second measure of pain symptoms was derived by subsetting the first symptom count, using further information derived from structured probes that are a standard part of the DIS-III-R. To determine the number of nontrivial pain symptoms, a measure was derived which counted the number of pain symptoms to which there was a positive response and in which the respondent told the interviewer that they either told a doctor or other professional about the problem or reported that the symptom interfered with his or her life or activities a lot. 3. Problem percent. The third measure of pain symptoms was derived by dividing the pain problem count by the pain symptom count, yielding an index of how likely it was that any experienced symptom caused either treatment-seeking or life interference. 4. Pain illness counts. The fourth measure of pain symptoms was derived by counting the number of pain symptoms that the respondent said were always the result of a physical illness or injury. 5. Unexplained pain counts. The last measure of pain symptoms was derived by counting the number of pain symptoms that were experienced, but were not attributed entirely to either medication, drugs, alcohol, physical illness or injury. These unexplained pain counts form a subset of the items that are typically used to render a DSM-III-R diagnosis of Somatization disorder.
STATISTIC ANALYSIS	
Analysis details	1. Logistic regression
RESULTS	
Result details	Table 1 Documented childhood victimization and pain symptoms in young adulthood (controlling for age, sex, race, and welfare status as a child)[a] Pain measure / Any documented abuse or neglect ($n = 676$) / Control ($n = 520$) / Documented sexual abuse ($n = 96$) / Control ($n = 520$) / Documented physical abuse ($n = 100$) / Control ($n = 520$) / Documented neglect ($n = 480$) / Control ($n = 520$) Pain symptom counts: 2.51 (0.08) / 2.36 (0.09) / 2.66 (0.21) / 2.35 (0.09) / 2.68 (0.20) / 2.28 (0.08)[‡] / 2.41 (0.09) / 2.32 (0.09) Pain problem counts: 1.98 (0.07) / 1.83 (0.08) / 2.07 (0.18) / 1.82 (0.08) / 2.23 (0.18) / 1.77 (0.07)[‡] / 1.88 (0.08) / 1.79 (0.08) Pain illness counts: 1.45 (0.06) / 1.32 (0.06) / 1.53 (0.15) / 1.32 (0.06) / 1.58 (0.15) / 1.28 (0.06)[‡] / 1.38 (0.07) / 1.30 (0.06) Unexplained pain counts: 0.50 (0.04) / 0.48 (0.04) / 0.52 (0.09) / 0.48 (0.04) / 0.60 (0.10) / 0.46 (0.04) / 0.48 (0.04) / 0.47 (0.04) Problem percent: 79.8 (0.01) / 76.0 (0.02) / 82.7 (0.04) / 75.9 (0.02)[§] / 84.7 (0.04) / 75.9 (0.02)[‡] / 78.1 (0.02) / 75.9 (0.02) [a] Values are mean (SE). [‡]$P \leq 0.05$, [§]$P \leq 0.10$. Retrospective self-reports of childhood victimization and pain symptoms in young adulthood (controlling for age, sex, race, and welfare status as a child)[a] Pain measure / Any self-reported childhood victimization ($n = 743$) / Control ($n = 520$) / Self-reported sexual abuse ($n = 291$) / Control ($n = 520$) / Self-reported physical abuse ($n = 610$) / Control ($n = 520$) / Self-reported neglect ($n = 384$) / Control ($n = 520$) Pain symptom counts: 2.68 (0.07) / 2.07 (0.09)* / 3.03 (0.12) / 2.12 (0.09)* / 2.74 (0.08) / 2.05 (0.09)* / 2.73 (0.10) / 2.04 (0.09)* Pain problem counts: 2.12 (0.06) / 1.58 (0.08)* / 2.43 (0.10) / 1.62 (0.08)* / 2.19 (0.07) / 1.57 (0.08)* / 2.11 (0.09) / 1.57 (0.08)* Pain illness counts: 1.52 (0.05) / 1.19 (0.07)* / 1.76 (0.09) / 1.20 (0.07)* / 1.57 (0.06) / 1.18 (0.07)* / 1.48 (0.08) / 1.18 (0.07)[†] Unexplained pain counts: 0.57 (0.03) / 0.38 (0.04)* / 0.64 (0.06) / 0.39 (0.04)* / 0.58 (0.04) / 0.38 (0.04)* / 0.62 (0.05) / 0.37 (0.04)* Problem percent: 78.9 (0.01) / 76.6 (0.02) / 81.3 (0.02) / 76.2 (0.02)[§] / 79.7 (0.01) / 76.6 (0.02) / 77.2 (0.02) / 76.7 (0.02) [a] Values are mean (SE). *$P \leq 0.001$, [†]$P \leq 0.01$, [§]$P \leq 0.10$. a) Documented childhood victimization The odds of reporting one or more unexplained pain symptoms was not significantly associated with any experience of childhood

	victimization (OR=1.20, 95% CI: 0.92, 1.57, p<0.10), sexual abuse (OR=1.39, 95% CI: 0.85, 2.26, p<0.10), physical abuse (OR=1.23, 95% CI: 0.74, 2.05, p<0.10) or neglect (OR=1.20, 95% CI: 0.89, 1.61, p<0.10). **Across all types of early childhood victimization, and across the different measures of pain complaints, the results revealed no significant relationship between early child abuse and neglect and pain complaints in young adulthood.** Since major depressive disorder (MDD) may provide a mechanism through which childhood trauma leads to pain in adulthood so that the association is restricted to those individuals who experienced MDD, they tested for interactions of each form of childhood victimization with lifetime history of major depression diagnosis in predicting each of the back pain symptom measures. **None of the MDD interaction effects approached significance, with the exception of the relationship between a history of childhood physical abuse and unexplained pain symptoms (p=0.006).**  Fig. 1. (Adjusted) mean unexplained pain counts broken down by a documented history of childhood physical abuse and lifetime history of major depressive disorder. Lines are drawn to aid point differentiation but do not imply a continuation function. b) Retrospective self-reports of childhood victimization **After controlling for demographic factors (age, sex, race, and welfare status as a child), logistic regression analyses revealed that self-reported childhood victimization was significantly associated with the report of one or more `unexplained' pain symptoms. The odds of one or more unexplained pain symptom was significantly associated with any self-reported childhood victimization (OR=1.98, 95% CI: 1.50, 2.62, p<0.0001), sexual abuse (OR=2.20, 95% CI: 1.54, 3.15, P<0.0001), physical abuse (OR=2.07, 95% CI: 1.55, 2.77, p<0001) and neglect (OR=2.38, 95% CI: 1.70, 3.32, p<0.0001).**
Conclusion	The prospective results using court documented cases of childhood sexual and physical abuse and neglect do not provide support for a

	relationship between early childhood victimization and pain symptoms assessed in young adults, unlike the retrospective self-report which revealed that childhood victimization was significantly associated with the report of one or more `unexplained' pain symptoms in adulthood.
Data extractors observation	Limitations: 1. Risk of bias in assessment of self-reported abuse. 2. The perpetrator was not named for sexual abuse.
Total quality criteria score	8

Authors/ Title/ Journal	**Raskin White, H., & Spatz Widom, C. (2003). Does childhood victimization increase the risk of early death? A 25-year prospective study. Child Abuse & Neglect.**
Their focus of the study	This paper compares mortality data and examines cause of death for a sample of 908 abused and/or neglected individuals and 667 matched controls who were followed-up into young adulthood.
COHORT DETAILS	
Source	The data employed in these analyses are from a research project based on a cohort design study (Leventhal, 1982; Schulsinger, Mednick, & Knop, 1981) in which abused and neglected children were matched with non-abused and non-neglected children and followed prospectively into young adulthood.
Age at recruitment	Children less than 12 years old.
Sample size at measure of exposure	1,575 children: 908 abused and/or neglected children and 667 matched controls.
Method of recruitment	The cases used were those of child abuse and neglect in records of the juvenile court and the adult criminal court from a metropolitan area in the US, Midwest, during the years 1967 through 1971. Only cases of child abuse and neglect that had been validated and substantiated by the court were included in the sample. Controls were matched with the sample on the basis of age, sex, race/ethnicity, and approximate family social class during the time period under study.
Recruitment rate	(1,575/2,757) * 100=57.13%
Geographic/ Socio-economic group	The abuse/neglect cases and the controls in this study are predominantly from lower socio-economic strata.
Date at start of study.	
FOLLOW UP	
Age at follow up	
Sample size at measure of outcome	1,575
Length of follow up	25 years
Percentage followed up	83%; cause of deaths known for only 70% of those who had died.
Bias/Other	
EXPOSURE	
	Cases of child abuse and neglect, validated and substantiated by a juvenile court or adult criminal court. 1. Juvenile court petitions.

	Physical abuse referred to “cruelty to children” with allegations that a specific individual had “knowingly and willfully inflicted unnecessarily severe corporal punishment” or “unnecessary physical suffering” upon the child. It also referred to knowing and willful exposure of the child to “unnecessary physical strains that may tend to injure the physical well-being” of the child. These cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury to the child. Sexual abuse cases varied from those involving relatively non-specific charges of “assault and battery with intent to gratify sexual desires” to more specific ones including “fondling or touching in an obscene manner,” rape, sodomy, and incest. Neglect cases were those in which the court found a child to have no proper parent care or guardianship, to be destitute, homeless, or living in a physically dangerous environment. The neglect petition reflected a judgment that the parents’ deficiencies in child care were beyond those found acceptable by community and professional standards at the time. These cases represented extreme failure to provide adequate food, clothing, shelter, and medical attention to children. Excluded from the sample of neglect cases were those that represented: (1) adoption of the child as an infant or in early childhood; (2) “involuntary” neglect only—usually resulting from the temporary institutionalization of the legal guardian; (3) placement only; (4) failure to pay child support; (5) the child was older than 11 at the time of the incident; or (6) the neglect was based solely on a “morals” charge, usually against the mother for her sexual activities. Thus, these findings are not generalizable to cases of adopted abused and neglected children. 2. Adult criminal court cases. Cases of extreme abuse and neglect were often handled in the adult criminal court, with a criminal charge filed against the adult defendant. They searched the court docket books for the years 1967 through 1971 to locate cases of abuse and neglect in which the victim was a child, recording any cases with charges of rape, incest, assault and battery with intent to gratify sexual desires, sodomy, concealing infants, kidnapping, child stealing, cruelty and neglect of children, aggressive sexual assault and battery, and desertion of a child. Microfilm records were then reviewed to determine whether the victim was a child (age 11 or under).
Confounder/ Other	
OUTCOME	
	1. Death In 1989 and again in 1994, the National Death Index (NDI) of the National Center for Health Statistics (NCHS) was searched for all abused and neglected and control subjects. NCHS files from 1979 (when the National Death Index began) to the most recent were searched. After receiving computerized reports from the NCHS, copies of official death certificates were requested and obtained from the appropriate state. Death certificate information was coded for cause of death, date, and circumstances. Two states (with one death each) did not provide this information. In these cases, the

	person was counted as dead but cause of death was unspecified. As part of the larger study, subjects were located and interviewed between 1989 and 1995. A participant was considered dead if the researchers located their name in the NDI or if they were able to corroborate their death through information received from a family member. They divided the causes of death into four categories: violent deaths (i.e., homicides and suicides), other high risk causes (i.e., accidents, HIV, substance use-related), medical (e.g., cancer), and unknown.
STATISTIC ANALYSIS	
Analysis details	The analyses were based on the full sample of 1,575 individuals. The main independent variable referred to the group (abuse/neglect vs. control). They also examined differences in mortality rates comparing males and females and Blacks and Whites.
RESULTS	
Result details	Table 1 Percent mortality by group, gender, and race 

	Total (%) (N = 1,575)	Abuse/neglect (%) (n = 908)	Control (%) (n = 667)	χ^2	Significant level (p)	Relative risk	
						RR	95% CI
Total	3.3	3.5	3.0	.33	.56	1.17	.26–5.31
Males	4.3	4.1	4.5	.08	.78	.91	.25–3.37
Females	2.4	3.0	1.5	1.89	.17	2.00	.29–13.92
Whites	3.5	3.9	3.0	.64	.42	1.30	.30–5.71
Blacks	2.7	2.5	3.0	.12	.73	.83	.16–4.36

Note: RR, relative risk; CI, confidence interval.

Table 2
Incidence density by group, gender, and race

	Abuse/neglect (N = 904)			Control (N = 666)			Relative risk	
	# died	# person years at risk	Incidence density	# died	# person years at risk	Incidence density	RR	95% CI
Total	28	23,404	.0012	19	17,302	.0011	1.09	.61–1.95
Males	17	11,318	.0015	14	8,521	.0016	.094	.45–1.85
Females	11	12,086	.0009	5	8,759	.0006	1.59	.55–4.59
Whites	20	15,692	.0013	12	11,205	.0011	1.19	.58–2.43
Blacks	7	7,253	.0010	7	6,097	.0011	.084	.30–2.40

Note: Five cases do not have year of death information and are not included.

Table 3
Cause of death by group

	Total (N = 52)		Abuse/neglect (n = 32)	Control (n = 20)	RR	95% CI
	n	%	%	%		
Violent	8	15	9	25	.44	.11–1.84
High risk	15	29	34	20	2.03	.65–6.33
Medical	12	23	25	20	1.29	.38–4.39
Unknown	17	33	31	35	.86	.29–2.5

Note: RR, relative risk; CI, confidence interval. Overall $\chi^2 = 3.02$ (3 *df*), $p = .39$.

Table 4
Incidence density for cause of death by group

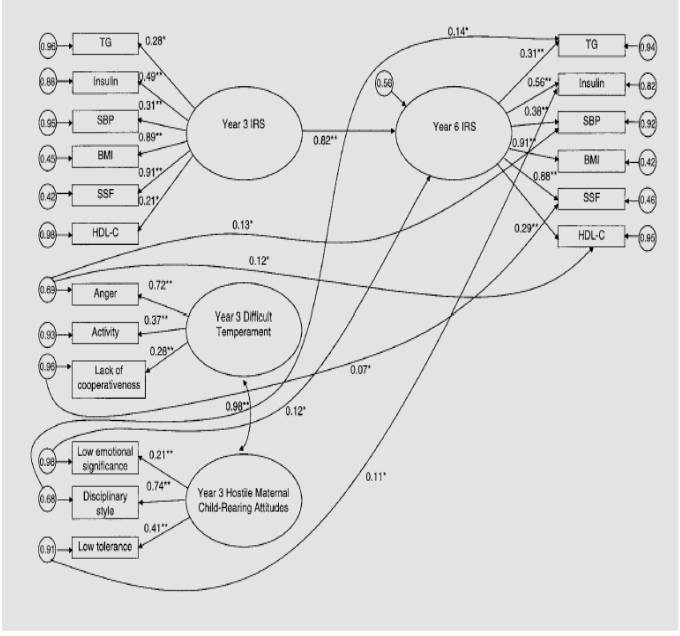
	Abuse/neglect (N = 904)				Control (N = 666)				Relative risk	
	# died	# person years at risk	Incidence density	Deaths per 10,000 person years	# died	# person years at risk	Incidence density	Deaths per 10,000 person years	RR	95% CI
Violence	3	23,663	.0001	1	5	17,416	.0003	3	.44	.11–1.85
High risk	11	23,623	.0005	5	4	17,426	.0002	2	2.03	.65–6.37
Medical	7	23,647	.0003	3	4	17,450	.0002	2	1.29	.38–4.41
Unknown	7	23,541	.0003	3	6	17,390	.0003	3	.86	.29–2.56

Note: Five cases do not have year of death information and are not included.

About 3% of the sample had died by 1995 (3.5% of the abused and/or neglected and 3.0% of the controls).

	There were no significant differences between the abused and/or neglected and control groups overall in terms of mortality, nor were there differences for males, females, Whites, or Blacks. There were 28 deaths in 23,404 total years at risk subsequent to the abuse and neglect in the abused and neglected individuals and 19 deaths in 17,302 person years at risk in the control group. Using these figures, the fatality rate was 12 per 10,000 years of risk for the abused and neglected group, compared to a fatality rate of 11 per 10,000 years of risk for the controls (RR = 1.09, 95% CI = 0.61–1.95). This difference was not statistically significant. None of the RRs for the sex or race comparisons reached acceptable levels of significance. **Of those who had died, a greater proportion of controls than abused and/or neglected individuals had died a violent death from either from homicide or suicide (abuse/neglect = 9%; controls = 25%), (abuse/neglect = 6.7%; controls = 10%) or had committed suicide (abuse/neglect = 3.3%; controls = 15%).** **Among those who had died, a greater proportion of abused and neglected (34%) than control (20%) deaths were in the other high risk category (i.e., AIDS, substance use-related, or accidents). Because of the small number of cases, none of these differences reached customary levels of significance.**
Conclusion	The results do not provide support for a heightened rate of early death in abused and neglected children followed up into young adulthood.
Data extractors observation	Limitations: 1. The sample was still relatively young at the time of follow-up and, therefore, rates of early death may be conservative. 2. In the follow-up, they located only 83% of the original sample, so that there may be some individuals who have died, but whose deaths we were not able to corroborate. The cause of death was known for only 70% of those who had died. 3. Although they eliminated all known cases of child abuse and neglect from the control group, they had no way of knowing how many cases of abuse went unreported in this sample.
Total quality criteria score	4

Authors/ Title/ Journal	**Ravaja, N., Katainen, S., & Keltikangas-Järvinen, L. (2001). Perceived difficult temperament, hostile maternal child-rearing attitudes and Insulin Resistance Syndrome precursors among children: a 3-year follow-up study. Psychotherapy and Psychosomatics.**
Their focus of the study	They prospectively examined the relationship between latent constructs of perceived difficult temperament and hostile maternal child-rearing attitudes, and the cluster of multiple cardiovascular risk factors comprising the insulin resistance syndrome (IRS).
COHORT DETAILS	
Source	Cardiovascular Risk in Young Finns (CRYF) study.
Age at recruitment	9 years old
Sample size at measure of exposure	523
Method of recruitment	The participants were the second youngest age cohort of the CRYF study who at the baseline of the present study (year 3 follow-up, n=523) were 9 years of age, and consequently were 12 years of age during the follow-up examination (year 6 follow-up, n=507). At year 3 and year 6, complete data were available from 451 participants.
Recruitment rate	(523/720) * 100=72.64%
Geographic/ Socio-economic group	The participants were 451 randomly selected healthy children (218 boys and 233 girls) who participated in the prospective epidemiological Cardiovascular Risk in Young Finns, in which the development of risk factors for CHD has been monitored at 3-year intervals beginning in 1980.
Date at start of study.	CRYF started in 1980; this cohort was studied starting with 1983.
FOLLOW UP	
Age at follow up	12 years old
Sample size at measure of outcome	507
Length of follow up	3 years
Percentage followed up	(507/523) * 100=97%
Bias/Other	
EXPOSURE	
	1. Maternal Child-Rearing Attitudes. At year 3, maternal child-rearing attitudes were self-rated by the mothers with a scale derived from the 'Operation Family' study. This scale consists of 9 items measured on a 5-point scale, ranging from 1 (totally agree) to 5 (totally disagree). The scale includes items tapping the child's emotional significance to the mother (e.g. 'The child is not emotionally significant to me'), the mother's low tolerance towards the child (e.g. 'The child is a

	burden to me') and the disciplinary style of the mother (e.g. 'Disciplinary measures are regularly needed'). These three dimensions closely correspond to the elements of a constellation Schaefer calls 'a hostile child-rearing practice' (i.e. the mother's [1] tendency to emotionally reject the child, [2] feeling that the child is a burden and [3] strict disciplinary style) [21]. That being so, measures of the child's emotional significance to the mother, the mother's low tolerance towards the child and the disciplinary style of the mother were comprised of 4, 3, and 2 items, respectively. Scores for each measure were derived by summing the scores for the items comprising the respective scales. The reliability of the measures has previously been shown to be acceptably high. The three measures were used as indicators of the latent factor of the hostile maternal child-rearing attitudes.
Confounder/ Other	
OUTCOME	
	1. At year 3 and year 6, the following measurements relevant for the IRS were obtained for all participants: serum insulin, serum HDL-C, serum TG, systolic blood pressure (SBP), weight (kg), height (m) and subscapular skinfold thickness (SSF).
STATISTIC ANALYSIS	
Analysis details	1. Means and standard deviations. 2. EQS structural equations program. The models were developed separately for boys and girls, since the relationship of psychosocial variables with metabolic CHD risk factors may differ according to gender.
RESULTS	
Result details	 **Fig. 2.** Final structural model for the girls. Rectangles indicate measured variables, ellipses represent latent constructs, and small circles represent residual or disturbance variables (variances). Two-headed arrows are correlations (correlations between the residual variables associated with the same indicator of IRS at successive points in time are not presented in the figure). Parameter estimates in the measurement and structural models are standardized. * $p < 0.05$; ** $p < 0.001$.

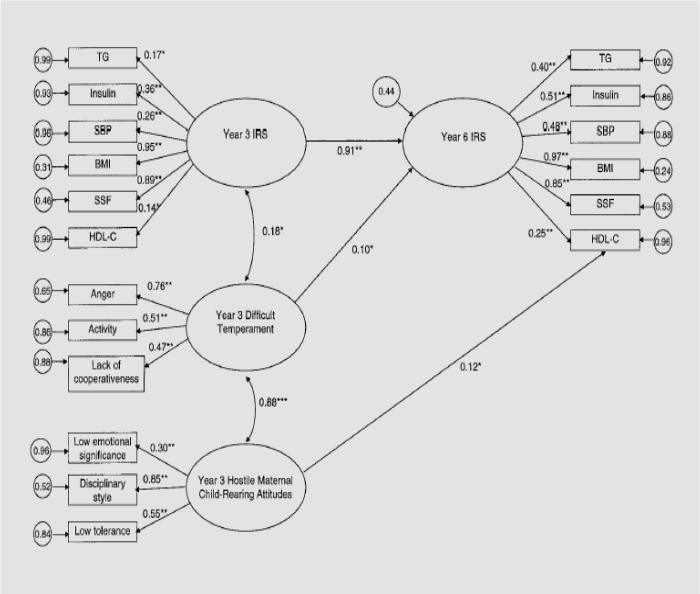


Fig. 1. Final structural model for the boys. Rectangles indicate measured variables, ellipses represent latent constructs, and small circles represent residual or disturbance variables (variances). Two-headed arrows are correlations (correlations between the residual variables associated with the same indicator of IRS at successive points in time are not presented in the figure). Parameter estimates in the measurement and structural models are standardized. * $p < 0.05$; ** $p < 0.001$.

Table 1. Means and standard deviations of physiological risk factors, maternal child-rearing attitudes and child temperament for girls and boys

Measure and year	Gender				F ratio
	girls (n = 233)		boys (n = 218)		
	M	SD	M	SD	
Maternal child-rearing attitudes at year 3					
Low tolerance	11.7	1.8	11.2	2.0	6.10*
Disciplinary style	2.9	1.3	3.4	1.7	13.79***
Low emotional significance	17.7	2.5	17.6	2.6	0.19

With regard to maternal child-rearing attitudes, mothers of girls exhibited lower tolerance towards the child, but their disciplinary style was less strict when compared with mothers of boys.

They also found one significant nonstandard or specific effect among boys; that is, hostile maternal childrearing attitudes predicted increased HDL-C. This effect was also unexpected, given that HDL-C is known to be a benign biological factor. It is of note, however, that (1) this effect relates to a specific or unique aspect of HDL-C (measured variable) that is substantively different from the common portion shared with the other indicators of the IRS latent factor and (2) unexpected associations between psychosocial factors and HDL-C have previously been reported.

Among boys, the latent construct of difficult temperament may be associated with the development of high levels of physiological CHD risk factors comprising the IRS.

Among girls, specific aspects of difficult temperament and hostile maternal child-rearing attitudes may predict increased levels of IRS or its components.

Conclusion	The study shows that: Only among girls, specific aspects of difficult temperament and hostile maternal child-rearing attitudes may predict increased levels of IRS or its components.
Data	Limitations:

extractors observation	1. Short follow-up.
Total quality criteria score	6

Authors/Title/ Journal	**Romans, S., Belaise, C., Martin, J., Morris, E., & Raffi, A. (2002). Childhood abuse and later medical disorders in women, an epidemiological study. Psychotherapy and Psychosomatics.**
Their focus of the study	The relationship between childhood abuse and physical illnesses in adulthood.
COHORT DETAILS	
Source	Random community sample of New Zealand women
Age at recruitment	Women less than 65 years old
Sample size at measurement of exposure	477 women, 252 women reporting CSA and 225 controls
Method of recruitment	In 1989, 3,000 women randomly selected from Otago, New Zealand, electoral rolls were posted a sociodemographic questionnaire, which included screening items for CSA. Two groups of urban women, under 65 years, were selected from those who returned their questionnaires only for interview: (1) all those who indicated that they had experienced some form of CSA (the CSA group) and (2) a control group of subjects randomly selected from all those who reported no CSA (the non-CSA group).
Recruitment rate	71%
Geographical/ Socio-economic group	Urban women living in Otago, New Zealand
Date at start of study.	1989
FOLLOW UP	
Age at follow up	Mean age=46.6 (SD=12.5); Range: 26-70
Sample size at measurement of outcome	354 women, 173 reporting CSA (39 non-genital, 80 non-penetrative genital, 54 intercourse) and 181 controls
Length of follow up	6 years
Percentage followed up	(354/477) * 100=74%
Bias/Other	1. Systematic bias in sample responding
EXPOSURE	
	1. Assessment and classification of CSA. During both interviews, data were collected on the nature and frequency of CSA, the relationship of the abuser to the subject and whether force, actual or threatened, was involved. CSA information was then classified into several grades of severity: 1 = non-contact abuse (lewd conversation, exposure); 2 = non-genital contact (e.g. touching breasts, buttocks, sexualized kissing); 3 = touching of the child's genitals; 4 = being made to

	touch the assailant's genitalia; 5 = attempted sexual intercourse (where the child was immobilized, removal of clothing and dual genital contact attempted); 6 = sexual intercourse (any act involving penile penetration of the vaginal or anal area, whether or not ejaculation took place). In general, 1995 variables are analyzed for this report, as they were contemporaneous with the physical health data. There was little change in CSA information between 1989 and 1995. The interviewers were all women, in the first phase 2 psychiatrists and a social scientist, in the follow-up phase a team of 5 social science graduates. 2. Assessment of other abuses. a) Parents' physical abuse. Several questions were posed about physical aggression received at the hands of parents during childhood, in the 1989 interview. For these analyses, we used an item of physical beating severe enough to leave lasting marks, carried out regularly. b) Adult physical and sexual abuse. Adult sexual and physical abuse was assessed in 1989 with items recording forced sexual or physical assault after the age of 16 years.
Confounder/ Other	
OUTCOME	
	1. Assessment of physical illnesses. In the 1995 interview, the participants were shown a card with 18 physical illnesses listed in carefully chosen lay terms. (The exact wording was: arthritis, serious back trouble, chronic fatigue, kidney/ bladder problems, pelvic pain, migraines/headaches, prolonged episodes of pain, other pain (please specify), irritable bowel, stomach/ digestive problems, asthma/breathing problems, cancer, diabetes, high blood pressure, heart trouble, stroke, other.) They were asked to focus on the previous 12 months only.
STATISTICAL ANALYSIS	
Analysis details	The frequency of each medical condition was compared in the various abuse groups using X^2 analysis, with Yates' continuity correction applied. The mean DSQ and DES scores were compared between women with and without each medical condition using Student's t test. Demographic variables (age, education) were compared in the groups with and without each medical condition using Student's t test for age means, and X^2 analysis for the proportion with/ without postsecondary education. The co-occurrence of medical conditions was assessed with Spearman's correlations.
RESULTS	
Result details	In the CSA sample, 26/173 (15.0%) also reported childhood physical abuse, 49/173 (28.3%) reported adult sexual abuse and 70/170 (41.2%) adult physical assault.

Table 1. Percentage of the two CSA groups (yes/no) with each medical condition in the previous 12 months

Medical condition	All CSA (n = 173)		Non-CSA (n = 181)		χ^2	p value	Odds ratio	95% CI
	n	%	n	%				
Chronic fatigue	26	15.0	11	6.1	6.65	0.008	2.73	1.31–5.72
Bladder problems	21	12.1	14	7.7	1.46	n.s.	1.65	0.81–3.36
Pelvic pain	10	5.8	7	3.9	0.35	n.s.	1.53	0.57–4.10
Headache/migraine	67	38.7	54	29.8	2.73	0.09	1.49	0.96–2.31
Chronic pain	9	5.2	10	5.5	0.00	n.s.	0.94	0.37–2.37
Irritable bowel	13	7.5	18	9.9	0.39	n.s.	0.74	0.35–1.56
Asthma	22	12.7	11	6.1	3.86	0.04	2.25	1.06–4.80
Diabetes	4	2.3	0	–	2.42	0.06	0.48	0.43–0.54
Cardiovascular	11	6.4	3	1.7	3.96	0.03	4.03	1.10–4.70

For χ^2, degrees of freedom = 1, in all cases. CI = Confidence interval.

Table 2. Percentage of the two childhood physical abuse (CPA) groups (yes/no) with each medical condition in the previous 12 months

Medical, condition	All CPA (n = 31)		Non-CPA (n = 323)		χ^2	p value	Odds ratio	95% CI
	n	%	n	%				
Chronic fatigue	6	19.4	31	9.6	1.93	0.09	2.26	0.86–5.93
Bladder problems	3	9.7	32	9.9	0.002	n.s.	0.97	0.28–3.39
Pelvic pain	1	3.2	16	5.0	<0.001	n.s.	0.64	0.08–5.00
Headache/migraine	12	38.7	109	33.7	<0.001	n.s.	1.24	0.58–2.65
Chronic pain	5	16.1	14	4.3	5.60	0.02	4.25	1.42–12.11
Irritable bowel	1	3.2	30	9.3	0.65	n.s.	0.33	0.04–2.47
Asthma	5	16.1	28	8.7	1.08	n.s.	2.03	0.72–5.69
Diabetes	0	–	4	1.2	<0.001	n.s.	0.91	0.88–0.94
Cardiovascular	3	9.7	11	3.4	1.51	n.s.	3.04	0.80–11.54

For χ^2, degrees of freedom = 1, in all cases. CI = Confidence interval.

Table 5. Summary of statistical relationships

Condition	All CSA	Genital + CSA	CPA	ASA	APA
Chronic fatigue	+	trend	trend	+	+
Bladder problems	–	+	–	trend	–
Pelvic pain	–	–	–	+	+
Headache/migraine	trend	–	–	–	+
Chronic pain	–	–	+	–	–
Irritable bowel	–	–	–	–	–
Asthma	+	–	–	–	–
Diabetes	trend	+	–	–	–
Cardiovascular	+	trend	–	–	–

CPA = Childhood physical abuse; ASA = adult sexual abuse; APA = adult physical abuse.

Table 6. Comparison of DSQ and DES scores (mean ± SD)

Medical condition	DSQ mature	DSQ neurotic	DSQ immature	DES
Chronic fatigue				
With	5.17 ± 1.68	4.76 ± 1.48	3.64 ± 1.12	1.54 ± 1.63
Without	5.26 ± 1.24	4.33 ± 1.15	3.25 ± 0.95	0.79 ± 1.02
t value, d.f., p	0.39, 352, n.s.	−2.07, 348, 0.04	−2.34, 352, 0.02	−2.72, 38.23, 0.01
Bladder problems				
With	5.03 ± 1.34	4.35 ± 1.15	3.32 ± 1.18	0.86 ± 1.13
Without	5.28 ± 1.28	4.38 ± 1.20	3.28 ± 0.95	0.87 ± 1.02
t value, d.f., p	1.06, 352, n.s.	0.14, 348, n.s.	−0.19, 352, n.s.	−0.05, 347, n.s.
Headache				
With	5.04 ± 1.27	4.33 ± 1.21	3.36 ± 0.95	1.13 ± 1.43
Without	5.36 ± 1.29	4.40 ± 1.18	3.25 ± 0.98	0.72 ± 0.89
t value, d.f., p	2.27, 352, 0.002	0.48, 348, n.s.	−1.08, 352, n.s.	−3.30, 347, 0.001
Chronic pain				
With	5.12 ± 1.27	4.61 ± 1.42	3.27 ± 0.96	0.83 ± 0.61
Without	5.26 ± 1.29	4.36 ± 1.18	3.29 ± 0.96	0.86 ± 1.14
t value, d.f., p	0.46, 352, n.s.	−0.86, 348, n.s.	0.10, 352, n.s.	0.12, 347, n.s.
Asthma				
With	5.27 ± 1.50	4.16 ± 1.48	3.26 ± 0.91	0.96 ± 1.58
Without	5.25 ± 1.27	4.40 ± 1.16	3.29 ± 0.98	0.85 ± 1.07
t value, d.f., p	−0.08, 352, n.s.	0.91, 36.19, n.s.	0.17, 352, n.s.	−0.54, 347, n.s.
Diabetes				
With	5.53 ± 0.64	5.00 ± 0.76	3.89 ± 0.94	1.13 ± 0.81
Without	5.25 ± 1.29	4.37 ± 1.19	3.28 ± 0.97	0.86 ± 1.12
t value, d.f., p	−0.44, 352, n.s.	−1.06, 348, n.s.	−1.24, 352, n.s.	−0.81, 347, n.s.
Cardiovascular				
With	5.71 ± 1.06	4.27 ± 1.19	3.26 ± 0.61	0.76 ± 0.80
Without	5.23 ± 1.29	4.38 ± 1.19	3.29 ± 0.99	0.87 ± 1.13
t value, d.f., p	−1.35, 352, n.s.	0.32, 348, n.s.	0.09, 352, n.s.	0.35, 347, n.s.

a) CSA:
Participants reporting any CSA were statistically more likely than the non-CSA participants to experience chronic fatigue, asthma and cardiovascular problems (listed as 'heart trouble'). There was also a non-significant trend at the 10% level for them to have more headache and diabetes. Whilst pelvic pain was more common in the CSA women, this was not statistically significant. The CSA women reported irritable bowel less frequently than the control participants did.

Similar results to all CSA were obtained when the sample was split by severity of the past CSA (grouping women who reported non-genital CSA with the non-CSA participants). One new condition only, bladder problems, emerged as statistically significant (CSA 20, 14.9%, vs. non-CSA 15, 6.9%; $X^2 = 5.07$, p = 0.02, OR = 2.36, 95% CI = 1.16–4.80). Diabetes became statistically significant (CSA 4, 3.0%, non-CSA, none; $X^2 = 6.55$, p = 0.02, OR = 0.38, 95% CI = 0.33–0.43) whilst chronic fatigue dropped to showing a statistical trend only (14.2 vs. 7.8%; $X^2 = 2.97$, p = 0.07, OR = 1.94, 95% CI = 0.97–3.89). Headache (p = 1.3, OR = 1.42, 95% CI = 0.90–2.23) and asthma were now not statistically significant (p = 0.44, OR = 1.37, 95% CI = 0.65–2.89). Pelvic pain still showed a non-significant difference only (CSA 5.2%, non-CSA 4.6%) and again more non-CSA women (10.1%) reported irritable bowel than CSA women (6.7%).

b) Childhood physical abuse
Only chronic pain emerged as significant (chronic fatigue showing a trend at the 10% level).

Most women (246/354, 69.5%) reported less than 2 abuse conditions, whilst 108 participants (30.5%) reported 2 or more. The medical conditions associated with 2+ reported abuse conditions were: (a) chronic fatigue (2+ abuses, 19/108, 17.6%, vs. 18/246, 7.3%; $X^2 = 7.40$, d.f. = 1, p = 0.007, OR = 2.70, 95% CI = 1.36–5.39); (b) chronic pelvic pain (2+ abuses, 10/108,

	9.3%, vs. 7/246, 2.8%, $X^2 = 5.42$, d.f. = 1, p = 0.01, OR = 3.48, 95% CI = 1.29– 9.42). The DSQ and DES results imply that immature coping strategies and increased rates of dissociation are probably important in chronic fatigue and headache but have no role to play in the other conditions.
Conclusions	In this random community sample, a number of chronic physical conditions were found more often in women who reported different types of sexual and physical abuse, both in childhood and in adult life.
Data extractors observations	Limitations: 1. This is a moderate-sized, random community based sample of women. 2. No confounder factors were discussed. 3. The study was designed to assess the impact of CSA on later health and well-being; the other abuse data were collected in an ancillary manner and did not arise from the central set of hypotheses being tested. Therefore, some analyses may have numbers too small for adequate statistical power. 4. Sequential attrition over the three phases of the study (1989 postal survey, 1989 interview study, 1995 interview) may have resulted in a systematic bias in the sample responding. There were no demographic differences between the 1989 and 1995 interview samples, but we do not have the data to examine whether there was a bias in the key variables of medical disorders and coping style. 5. Recall bias (self-reported symptoms). 6. CSA-not only parents.
Total quality criteria score	3

Authors/ Title/ Journal	**Schwebel, D.C., Brezausek, C.M., Ramey, S.L., & Ramey, C.T. (2004). Interactions between child behavior patterns and parenting: implications for children's unintentional injury risk. Journal of Pediatric Psychology.**
Their focus of the study	The aim of the study was to investigate if temperamentally at-risk children for unintentional injury could be protected in the environment of positive parenting.
COHORT DETAILS	
Source	The article presents two studies, but the inclusion criteria could be applied only for the second study. Data for Study 2 came from the longitudinal Study of Early Child Care by the National Institute of Child Health and Human Development (NICHD Early Child Care Research Network, 1994, 1998, 2001).
Age at recruitment	Children were recruited and entered into the study at 1 month of age.
Sample size at measure of exposure	1,364 children and their families
Method of recruitment	Children were recruited from 10 geographically diverse hospitals in the US. Data reported in the present study were collected through questionnaires at 1 month, phone calls or face-to-face interviews at 3-month intervals from 9 through 36 months, and face-to-face contact with families at 6 months.
Recruitment rate	
Geographic/ Socio-economic group	The sample was 80% white, 13% African American, and 7% other ethnicities. Mothers had an average of 14.31 years of education.
Date at start of study.	2001
FOLLOW UP	
Age at follow up	36 months old
Sample size at measure of outcome	1,041
Length of follow up	30 months
Percentage followed up	76.32%
Bias/Other	1. Recall bias: the study relies on caregiver report of injuries at 3-month interview intervals. 2. Unexpected results: child temperament was not a significant predictor of injury. Methodologically, due to a large quantity of missing data, the NICHD team summed scores from a number of temperament scales to create a single estimate of children's temperament. That aggregated scale might have lacked the specificity of temperamental traits used previously.

	Developmentally, most previous work on behavior and injury risk has been conducted with older children. Developmental change in temperamental expression or injury etiology may explain the nonfinding.
EXPOSURE	
	1. The Infant/Toddler HOME Inventory was conducted when children were 6 months of age to evaluate the home environment. Factor analyses were conducted on the 45-item inventory and indicated that several of the measures were not directly relevant to the home environment of 6-month-old children (e.g., ‘‘family has a pet,’’ ‘‘push or pull toy present’’). Those items were dropped and a principal components analysis was conducted with the remaining 25 items. That analysis yielded a single factor with an eigenvalue greater than 2, which was labeled positive parenting and included 9 items with factor loadings greater than or equal to 0.4 (e.g., ‘‘parent spontaneously vocalizes to child at least twice,’’ ‘‘parent structures child’s play periods’’). Responses to those 9 items were summed to create the full measure (Range: 0-9).
Confounder/ Other	
OUTCOME	
	1. Injuries. Caregivers reported their children’s history of injuries requiring professional medical attention on a quarterly basis, through either telephone interviews or interviews during scheduled visits by research staff. For the purposes of this study, all injuries reported by parents from the 9-month phone assessment until the 36-month visit were summed to create a single measure of injuries experienced from 6 to 36 months. This permitted a prospective analysis to predict injuries from age 6 to 36 months based on the measures collected at the 6- and 7-month evaluation periods.
STATISTIC ANALYSIS	
Analysis details	1. Descriptive statistics 2. Backward elimination linear regression analysis. Each variable listed in Table IV served as a predictor variable, with the exception of the number of injuries, which was the dependent variable. Four interactions were also computed and entered: child’s activity level by positive parenting, child’s activity level by parent’s social interaction with child, child’s temperament by positive parenting, and child’s temperament by parent’s social interaction with child. Table V illustrates the results. Using a criterion of $p>0.10$ to drop variables out of the model, six univariate predictors and two interactional predictors were retained in the final model. Three of the variables retained were significant at the $p<0.05$ level: child sex, positive parenting, and the interaction between temperament and positive parenting.
RESULTS	

Result details	**Table IV. Characteristics of Study 2 Sample** Variable — *M* (*SD*) Family characteristics Household size (number of people) — 4.04 (1.27) Household income ($/year) — 48,720 (39,908) Child characteristics (% male = 52%) Activity level — 2.45 (.57) Temperament — 3.18 (.40) Number of injuries — 0.35 (0.64) Parent characteristics Mothers' years of education — 14.23 (2.51) Positive parenting — 7.08 (1.77) Social interaction with child — 124.05 (98.93) **Table V. Study 2 Backward Elimination Linear Regression Predicting Injuries, Ages 6–36 Months** Predictor (6–7 months) — *F* Univariate predictors Household size — 3.43* Household income — 3.49* Mother education — 3.30* Child sex — 4.78** Parent's social interaction with child — 2.83* Positive parenting — 6.67*** Interactional predictors Child temperament by parent's social interaction with child — 2.98* Child temperament by positive parenting — 4.08** The following variables were entered but dropped out of the model because the probability of the *F* statistic was $p < .10$ in the following order: child temperament, child activity level by parent's social interaction with child, child activity level, child activity level by positive parenting. On first step, $R^2 = 0.02$; $F(8, 1052) = 2.67$, $p < .01$. * $p < .10$; ** $p < .05$; *** $p < .01$. **Boys had significantly more injuries than girls, and children with parents who showed positive parenting were protected from injury. The interaction between children's temperament and positive parenting was related to reduced injury risk.** **Unexpected result: child temperament was not a significant predictor of injury.**
Conclusion	Children at increased risk for injury, i.e., those with hyperactive and difficult behavior patterns, might be protected in the environment of positive parenting.
Data extractors observation	
Total quality criteria score	1

Authors/ Title/ Journal	**Sickel, A.E., Noll, J.G., Moore, P.J., Putnam, F.W., & Trickett, P.K. (2002). The long-tem physical health and health care utilization of women who were sexually abused as children. Journal of Health Psychology.**
Their focus of the study	The relationship between childhood sexual abuse and the long-term physical care and health care utilization of 148 women.
COHORT DETAILS	
Source	Abused females referred by protective service agencies in Washington DC metropolitan area.
Age at recruitment	6-16 years old
Sample size at measure of exposure	166 women
Method of recruitment	Abused females referred by protective service agencies in Washington DC metropolitan area. The initial assessment (Time 1) sample consisted of a total of 166 participants, and two follow-up interviews (Time 2 and 3) were conducted at one-year intervals after the initial assessment, and a third follow-up (Time 4) was conducted two or three years subsequent to the Time 3 (on average of 7 years after the initial assessment).
Recruitment rate	
Geographic/ Socio-economic group	Low to middle SES women living in Washington DC metropolitan area. Comparison females were recruited via community advertising and were similar top the abused participants in terms of ethnic group, age, pre-disclosure socio-economic status, family constellation (one or two parent families) and other nonsexual traumas.
Date at start of study.	
FOLLOW UP	
Age at follow up	13-23 years old
Sample size at measure of outcome	148 women (64 abused and 84 non-abused-63 original + 21 new recruits)
Length of follow up	7 years
Percentage followed up	87%
Bias/Other	
EXPOSURE	
	1. Child sexual abuse. Eligibility criteria for inclusion in the study were: (1) the victim was female, aged 6-16, (2) disclosure of referring abuse occurred within 6 months of participation; (3) sexual abuse involved genital contact and/or penetration; (4) the perpetrator was a family member including parent, step-parent, sibling, uncle or mother's live-in boyfriend; and (5) non-abusing parent or guardian (usually the child's mother) was willing to participate in the study.

Confounder/ Other	
	Confounders: 1. Age 2. SES 3. Minority status 4. Time since last visit
OUTCOME	
	1. General somatic complaints. NIH Medical History Form is a 73 items self-report National Institute of Health standard health assessment checklist. Items are scored as 1=yes and 0=no and inquire about a range of health conditions (e.g. blood pressure, diabetes, broken bones, sexually transmitted diseases, allergies). Scores represent the sum of the 73 items and therefore range from 0 to 73. The somatic complaints subscale from the Youth Self Report by Achenbach and Edelbrock is a nine-item subscale of the YSR measuring physical complaints (e.g. aches/pain, nausea, rashes, problems with eyes) with no known medical cause. Items are scored as 0 'not true'; 1 'somewhat or sometimes true'; or 2 'very or often true' and can there fore range from 0 to 18. 2. Specific health complaints. These data were obtained through self-report as a part of the Time 4 interviews and represent an update in participant health status since time of last visit. Variables gleaned from this interview include: digestive problems, headaches, backaches, infections, colds and flu, scored from 1 'none' to 4 'many'. Eating problems, sleeping problems, on medication and menstrual problems were scored as 1 'yes' or 0 'no'. 3. Healthcare utilization. These data were obtained through self-report as part of the Time 4 data collection and represent an update in participant health status since time of last visit. Variables include: doctors visits, a continuous variable scored as the number of doctor visits the participant reported having since time of last interview and ranges from 0-87; hospitalization, scored as 1 'yes' or 0 'no'; major illness scored from 1 'none' to 4 'many' and body mass index (BMI) was calculated from height and weight obtained at the time of the interview). Participants received a score of '1' on the overweight variable if the BMI was greater than 30 and a '0' if the BMI was less than 0.
STATISTIC ANALYSIS	
Analysis details	1. Factor analysis of health variables 2. Missing data imputation 3. MANOVA 4. Logistic regression
RESULTS	
Result details	**In univariate analyses, the abuse group scored significantly higher on GI/GYN (p=0.02) and healthcare utilization (p=0.0006) than did the comparison group when the demographic variables were controlled.** **In the logistic regression model, both GI/GYN and healthcare**

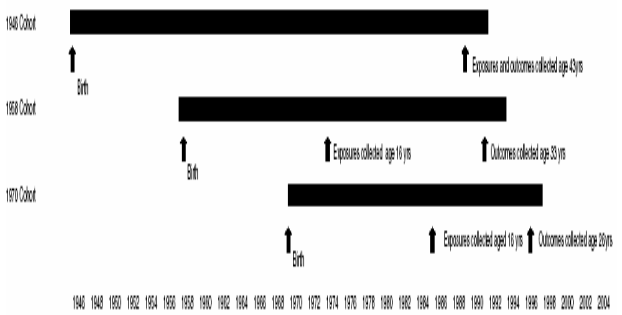
	utilization emerged as significant, independent predictors. For a one-unit increase in GI/GYN there is a 24.2 % chance of being in the abused group (OR=1.242, p=0.042). For a unit increase in healthcare utilization there is a 54.6% chance of being in the abused group (OR=1.546, p=0.002). **Analyses, controlling for the confounding factors, indicate no differences between the three group profiles subgroups on general health problems, vegetative symptoms, colds and flu, GI/GYN, and healthcare utilization factors.** **However, the MP group scored highest on the GI/GYN factor, significantly higher than the comparison group (p=0.0026), and slightly higher than both the SP (trend, p=0.06) and BF (trend, p=0.08) subgroup.** **Results also indicate that all three profile subgroups scored higher than the comparison group on healthcare utilization,** where SP and BF profile subgroups scored significantly higher than the comparison group (p=0.0079, p=0.0003 respectively), and MP profile subgroup scored slightly higher than the comparison group (trend, p=0.07).
Conclusion	Findings suggest that: (1) sexual abuse affects long-term health outcomes (especially GI/GYN problems) and health care utilization; and (2) physical health sequel of abuse may differentially affect females, depending upon the pattern of abuse characteristics.
Data extractors observation	Limitations: 1. All data except BMI and participant's group status reflect subjective report. 2. These data reflect the experiences of those females whose abuse was reported and who consented to participate in the research. The sample might not be representative for the most extreme cases or the unreported ones. 3. The perpetrator is not necessarily the parent.
Total quality criteria score	6

Authors/ Title/ Journal	**Soubhi, H., Raina, P., & Kohen, D. (2004). Neighborhood, family, and child predictors of childhood injury in Canada. American Journal of Health Behavior.**
Their focus of the study	To examine independent and combined effects of child, family, and neighborhood on medically attended childhood injuries.
COHORT DETAILS	
Source	Census Linked National Longitudinal Survey of Children and Youth (NLSCY), Canada.
Age at recruitment	0 to 11 years old
Sample size at measure of exposure	9,796 children and the person most knowledgeable about the child (PMK)
Method of recruitment	Data were collected from cycle 1 and 2 of NLSCY. Cycle 1-1994-1995: random probability sample of Canadian residential households with children aged 0-11, one child aged 0-11 was randomly selected from each household, other children were also randomly selected to a maximum of 4 per household. Cycle 2-1996-1997: all responding households In cycle 1; 10,261 households in cycle 2 out of 13,439 households in cycle 1; the cycle 2 households included 15,468 children 2-13 years old and one child per household was randomly selected for this study.
Recruitment rate	(9,796/15,468) * 100=63.33%
Geographic/ Socio-economic group	Canadian residential households with children aged 0-11.
Date at start of study.	1994
FOLLOW UP	
Age at follow up	2 to 13 years old
Sample size at measure of outcome	
Length of follow up	2 years
Percentage followed up	
Bias/Other	
EXPOSURE	
	1. Parenting items measured the frequency of praise, punishment, rule creation and enforcement, and general interaction with the child. -children less than 2 years old-positive parenting;

	-children 2-11 years old-positive parenting -parenting consistency Positive parenting: "How often do you praise (name) by saying something like Good for you!"; "How often do you talk or play with each other, focusing attention on each other for 5 minutes or more, just for fun?" Parenting consistency: "If you tell (name) that he/she will get punished if he/she doesn't stop doing something, and he/she keeps doing it, how often will you punish him/her?, "When you give him/her a command or order to do something, what proportion of the time do you make sure that he/she does it?" The PMK rated each item on a 4-item point scale from 0 (never) to 3 (many times each day). Higher scores represent higher frequencies.
Confounder/ Other	
	Confounders: 1. Child's age 2. Gender 3. Number of persons in the household 4. Family SES 5. PMK restriction of activity assessing the activity restriction due to chronic illness 6. Depression scores for PMK 7. Child injury's status in cycle 1
OUTCOME	
	1. Injury occurrence. The interviewer asked the PMK about child injuries that occurred during the last 12 months, and required medical attention or contact with health care services. As outcome variable was used the injury occurrence during the last 12 months for children participating in cycle 2 of the survey.
STATISTIC ANALYSIS	
Analysis details	1. Logistic regression; 3 child's age strata were used: less than 2 years, 2-3 years and 4-11 years old.
RESULTS	
Result details	Similar probabilities of being injured were observed in all age groups (less than 2 years: 11.5%, 2-3 years: 10.0%, 4—11 years: 11.8%). **Boys (all ages combined) had a significantly higher probability of being injured in cycle 2: 13.4% versus 9.5%, p<0.05.** **Children 2-3 years old: significant protective effects were found for girls, positive parenting and percentage of single females in the neighborhood.** **Children 4-11 years old: A lower risk of injury was found for girls and below-average parenting consistency was linked to a significant risk of injury.**
Conclusion	Quality of parenting was predictive of injury for children aged 2 to 11 years old.
Data	Limitations: 1. Risk of reporting bias (injuries reported by PMK).

extractors observation	
Total quality criteria score	1

Authors/ Title/ Journal	**Stewart-Brown, S.L., Fletcher, L. & Wadsworth, M.E.J. (2005). Parent–child relationships and health problems in adulthood in three UK national birth cohort studies. The European Journal of Public Health.**
Their focus of the study	Event-based measures suggest that emotional adversity in childhood has a long-term health impact, but less attention has been paid to chronic emotional stressors such as family conflict, harsh discipline or lack of affection. This study aimed to assess the impact of the latter on health problems and illness in adulthood.
COHORT DETAILS	
Source	The first three British birth cohorts (1946, 1958, 1970).
Age at recruitment	Birth
Sample size at measure of exposure	**Table 2** Number of subjects (% of those estimated to be alive and living in UK at that age) on whom data were available for analyses in each data sweep, and number on whom exposure and outcome data were available for analysis Cohort 1946 / 1958 / 1970 Eligible at birth: 5958[a] (100%) / 16460 (100%) / 16995 (100%) Contacted age 16 years: N/A / 12098 (72%) / 6349 (39%) Contacted age 26/33/43 years: 3262 (67.0%) / 11407 (73%) / 9003 (56%) Included in analyses: 3254 (66.8%) / 7141 (63%) / 4493 (38.5%)[b] a: Estimated from actual number (5362) selected for follow-up from those sampled at birth inflated to take account of the 90% contact rate at birth b: 3399 in models including adjustment for teenage depression
Method of recruitment	The first three UK birth cohort studies began by collecting data on all babies born in the UK during a single week, the second in 1958 and the third in 1970. The earlier cohort differs from the other two in that only legitimate, singleton babies, those whose fathers worked in non-manual or agricultural occupations, and a randomly selected quarter of those born to parents in manual social classes, were selected for follow up.
Recruitment rate	
Geographic/ Socio-economic group	In the 1958 cohort those included in the analyses differed from the entire group surveyed at age 16 years in that they were slightly less likely to be manual social class (62% compared with 65%), more likely to have been living with two biological parents (90% compared with 84%) and less likely to be male (49% compared with 52%). Such biases were evident to a greater degree in the 1970 cohort where comparable figures were manual social class (48.6% compared with 59.7%), living with two biological parents (81% compared with 76%) and male (39% compared with 52%).
Date at start of study.	1958, 1970.
FOLLOW UP	

Age at follow up	
Sample size at measure of outcome	See Table 2.
Length of follow up	1958 cohort: 17 years 1970 cohort: 10 years
Percentage followed up	Complete data on exposure and outcomes were available for 7141 (63.0%) 1958 cohort members and 4493 (38.5%) 1970 cohort members.
Bias/Other	Subjects lost to follow up at 16 years in 1958 and 1970 cohorts were more likely to be from the non-manual classes and to have been diagnosed as suffering from mental illness. In the 1970 cohort, models that included adjustment for depression were restricted to the 3399 subjects on whom data on was available on this confounding factor as well as on exposures and outcomes.
EXPOSURE	
	1958 cohort: at age 16 years cohort members were asked to respond in a self-completion questionnaire to the statements 'I get on well with my mother' and 'I get on well with my father'. 5.1% responded untrue/very untrue with regard to their mothers and 8.0% with regard to their fathers. 1970 cohort: at age 16 years cohort members completed an inventory developed for the study modeled on questions in the Parental Bonding Instrument which asked 'which of the following descriptions would you say fits best how you get on with your parent(s)?' Five items described positive aspects of the relationship, and six items described negative aspects. Positive statements were endorsed more frequently than negative with 82.4% endorsing the statement 'allow me freedom of action within reason', 60.4% 'are helpful/good in a crisis', 18.3%'don't understand me/my motives', 9.6% 'treat me like a child' and 7.1% 'are strict, bossy, have too many rules'.
Confounder/ Other	
	Confounders: 1. Sex 2. Social class 3. Current mental health problems using the psychiatric symptom frequency scale score (a 19 item self-report inventory covering symptoms of depression and anxiety) 4. Relationship with the other parent 5. Social Class
OUTCOME	

	In all cohorts members were asked if they suffered from any of a list of common health problems or diseases. Conditions covered in all three cohorts included asthma/wheezing, bronchitis, back pain/sciatica/lumbago, arthritis/painful joints, diabetes, epilepsy/convulsions, hay fever, bladder/kidney problems, migraine, stomach problems/indigestion, trouble with gums/teeth. 1958 and 1970 cohort subjects were asked about gynaecological/period problems; 1958 about heart trouble and dizziness; 1970 cohort about depression/nervous or emotional problems, and 1970 about hearing or ear problems. 1970 cohort subjects were asked to report other health problems.
STATISTIC ANALYSIS	
Analysis details	1. Logistic regression
RESULTS	
Result details	Table 4 reports the odds of experiencing multiple health problems age 33 years in the 1958 cohort according to the quality of the mother–child relationship at 16 years.

Table 4 Multinomial regression reporting odds of one, two and three or more health problems or diseases in the previous 12 months compared to none, in subjects who reported on the quality of relationship with their mother at 16 years (unadjusted and adjusted models; 1958 cohort aged 33 years)

Do you get on well with your mother ?	Odds of one health problem OR (95% CI); *P* value	Odds of two health problems OR (95% CI); *P* value	Odds of three or more health problems OR (95% CI); *P* value
Unadjusted (n = 7141)			
Very true/True	1.00	1.00	1.00
Uncertain	1.05 (0.82–1.36); 0.689	1.14 (0.87–1.50); 0.343	1.1 (0.9–1.5); 0.348
Untrue/very untrue	1.03 (0.75–1.43); 0.844	1.06 (0.75–1.52); 0.731	1.6 (1.1–2.2); 0.006
Statistics for model	χ^2 = 13.75 d.f. 6; $P < 0.033$		
Adjusted for sex and social class (n = 7141)			
Very true/True	1.00	1.00	1.00
Uncertain	1.05 (0.82–1.36); 0.688	1.13 (0.86–1.49); 0.365	1.11 (0.85–1.47); 0.430
Untrue or very untrue	1.03 (0.7–1.4); 0.843	1.05 (0.73–1.49); 0.806	1.51 (1.09–2.11); 0.014
Statistics for model	χ^2 = 221.6 d.f. 15; $P < 0.001$		
Adjusted for sex social class and relationship with father (n = 6805)			
Very true/True	1.00	1.00	1.00
Uncertain	1.03 (0.78–1.34); 0.855	1.10 (0.82–1.48); 0.513	0.92 (0.69–1.24); 0.590
Untrue or very untrue	0.97 (0.68–1.37); 0.959	1.01 (0.69–1.48); 0.941	1.34 (0.94–1.91); 0.102
Statistics for model	χ^2 = 236.2 d.f. 21; $P < 0.001$		

Table 5 presents the same analyses for relationship with father. Both the unadjusted analyses, and those adjusted for social class and sex show an increased odds of reporting three or more health problems age 33 years among those who reported a poor/very poor relationship with their mother.

After adjusting for relationship with father the odds ceased to be significantly raised. There was no increased risk in these models for two or fewer health problems or diseases. Table 5 suggests a greater health impact of a poor relationship with father.

For those who reported a poor/very poor relationship, the odds of three or more health problems were raised, by 60–80% in all three models, as were the odds of one health problem (40%).

Those reporting uncertainty about their relationship with their father also had increased odds of reporting three or more health problems in all three models (40–50%).

In a series of analyses, which examined results for men and women separately (not shown), the effect was demonstrated to be stronger in women than men.

The odds of experiencing health problems age 26 years were also raised for those reporting a poor relationship with their parents in the 1970 birth cohort, both in unadjusted analyses and in those adjusted for sex and social class (data not shown).

Additional adjustment for teenage depression attenuated the odds only slightly.

Table 5 Multinomial regression reporting odds of one, two and three or more health problems or diseases in the last twelve months compared to none, in subjects who reported on the quality of relationship with their father age 16 years (unadjusted and adjusted models; 1958 cohort age 33 years)

Do you get on well with your father?	Odds of one health problem OR (95% CI); *P* value	Odds of two health problems OR (95% CI); *P* value	Odds of three or more health problems OR (95% CI); *P* value
Unadjusted (n = 7141)			
Very true/True	1.00	1.00	1.00
Uncertain	1.03 (0.83–1.27); 0.790	1.03 (0.74–1.39); 0.794	1.47 (1.18–1.83); 0.001
Untrue/very untrue	1.37 (1.04–1.80); 0.025	1.02 (0.82–1.30); 0.926	1.80 (1.35–2.38); 0.000
Statistics for model	χ^2 = 40.48 d.f. 6; $P < 0.0001$		
Adjusted for sex and social class (n = 7141)			
Very true/True	1.00	1.00	1.00
Uncertain	1.03 (0.83–1.28); 0.782	1.02 (0.81–1.29); 0.856	1.42 (1.13–1.76); 0.002
Untrue or very untrue	1.36 (1.03–1.79); 0.028	0.99 (0.72–1.35); 0.930	1.63 (1.22–2.17); 0.001
Statistics for model	χ^2 = 234.4 d.f. 15; $P < 0.001$		
Adjusted for sex social class and relationship with mother (n = 6805)			
Very true/True	1.00	1.00	1.00
Uncertain	1.01 (0.80–1.26); 0.782	0.99 (0.76–1.27); 0.856	1.42 (1.12–1.79); 0.004
Untrue or very untrue	1.4 (1.1–1.9); 0.05	1.02 (0.74–1.41); 0.930	1.59 (1.18–2.14); 0.02
Statistics for model	χ^2 = 236.2 d.f. 21; $P < 0.001$		

In the latter analyses (Table 6) the odds of reporting three or more health problems were raised between 30 and 80% in subjects endorsing five out of the six negative descriptors of the parent–child relationship, particularly 'don't understand me/my motives' 'are strict/bossy/have

too many rules' and 'treat me like a child'. The first two of these statements were also predictive of one health problem.

Positive aspects of the parent–child relationship were not predictive of health problems in any of the analyses. When all descriptors of relationships were entered into the regression analyses together (results not shown) two negative descriptors 'don't understand me or my motives' and 'are strict/bossy/have too many rules' proved the most predictive. Results were positive when analysed for men and women separately (not shown), but the variables which were predictive differed. In women 'can't understand what they want', 'don't understand me/my motives' and 'nagging/moaning/complaining' were predictive of three or more health problems after controlling for social class and teenage depression. In men it was the variables 'treat me like a child' and 'strict/bossy/have too many rules' which were predictive.

Table 6 Multinomial regression reporting the odds of one two and three or more health problems compared to no health problems or diseases in subjects who reported on the quality of their relationship with their parents age 16 years (adjusted models for social class, sex and teenage depression; 1970 birth cohort age 26 years)

Aspects of parental relationship Reported age 16 years $n = 3399$	Odds of one health problem OR (95% CI); *P* value $n = 990$	Odds of two health problems OR (95% CI); *P* value $n = 672$	Odds of three or more health problems OR (95% CI); *P* value $n = 769$	χ^2 for model (d.f. 15); *P* value
My parents:				
Allow me freedom of action within reason	0.94 (0.73–1.20); 0.599	1.10 (0.83–1.46); 0.494	0.88 (0.68–1.14); 0.877	149.29; <0.001
Are understanding/can talk to them	1.03 (0.86–1.24); 0.731	1.18 (0.97–1.45); 0.107	0.99 (0.81–1.20); 0.917	149.96; <0.001
Are loving/caring/look after me	1.04 (0.84–1.28); 0.733	1.22 (0.96–1.54); 0.102	1.0 (0.80–1.26); 0.966	149.82; <0.001
Are helpful/good in a crisis	1.04 (0.86–1.25); 0.690	1.08 (0.88–1.32); 0.479	1.08 (0.88–1.33); 0.422	147.34; <0.001
Are generous/buy me lothes/things I need	0.94 (0.79–1.13); 0.506	0.98 (0.80–1.20); 0.840	0.90 (0.74–1.09); 0.288	147.86; <0.001
Are overprotective/fussing	0.96 (0.77–1.20); 0.714	1.15 (0.91–1.46); 0.251	1.09 (0.86–1.38); 0.477	149.27; <0.001
Treat me like a child	1.21 (0.87–1.69); 0.254	1.38 (0.97–1.97); 0.075	1.58 (1.12–2.21); 0.009	154.02; <0.001
Don't understand me/my motives	1.34 (1.05–1.71); 0.021	1.06 (0.80–1.41); 0.688	1.51 (1.17–1.96); 0.002	159.16; <0.001
I feel I can't understand what they want	1.19 (0.91–1.55); 0.197	1.25 (0.94–1.67); 0.122	1.4 (1.06–1.84); 0.017	152.58; <0.001
Are strict/bossy/have too many rules	1.88 (1.27–1.79); 0.002	1.6 (1.06–2.53); 0.027	1.79 (1.17–2.72); 0.007	158.46; <0.001
Are nagging/moaning/complaining	1.09 (0.88–1.36); 0.470	1.03 (0.81–1.30); 0.843	1.32 (1.05–1.65); 0.019	152.93; <0.001

Conclusion	Poor quality parent–child relationships could be a remediable risk factor for poor health in adulthood.
Data extractors observation	Limitations: 1. The measures of the quality of parent–child relationships available in these cohort studies all suffer some drawbacks. Exposure measures in the cohorts may not offer an accurate

	picture of relationships throughout childhood as they were gathered during adolescence when conflict tends to increase. The 1958 measure provides only a general view of relationship quality, but allows a distinction to be made between relationship with mother and father. The 1970 cohort study gathered data on specific aspects of the parent–child relationship with questions modeled on items from a validated measure. However, the inventory was not validated and the data do not make it possible to distinguish between mother and father relationships. The question was asked in such a way that non-response cannot be distinguished from disagreement. The responses to questions in this cohort are therefore likely to provide minimum estimates. In all three cohorts, imprecision in measurement is likely to have resulted in some misclassification of subjects and this may have reduced the observed strength of association between exposures and outcome measures. 2. The generalisability of our findings is compromised by incomplete data capture and the biases apparent in the group for whom data are available. Children in single parent families, manual social classes and boys are underrepresented. 3. Adjustment was restricted to the key confounding factors—sex and social class—and our results may be affected by residual confounding attributable to other aspects of poverty or social deprivation.
Total quality criteria score	4

Authors/ Title/ Journal	**Surtees, P., Wainwright, N., Day, N., Brayne, C., Luben, R., & Khaw, K.T. (2003). Adverse experience in childhood as a developmental risk factor for altered immune status in adulthood. International Journal of Behavioural Medicine.**
Their focus of the study	To investigate the hypothesis that adverse experience in childhood is associated with peripheral leukocyte count in adulthood.
COHORT DETAILS	
Source	European Prospective Investigation into Cancer and Nutrition in Norfolk, UK (EPIC-Norfolk)
Age at recruitment	43-77 years old
Sample size at measure of exposure	18,248 participants
Method of recruitment	During 1993-1997 EPIC-Norfolk recruited, through general practice age-sex registers, 30,414 men and women aged 4-74 years and resident in East Anglia, UK, and a baseline questionnaire survey was completed. All participants were asked to complete details of their educational qualifications and medical history, including whether a doctor had ever confirmed to them a diagnosis of a range of conditions that included: cancer, diabetes, heart attack, and stroke. Subsequently, 25,637 participants attended a first, and on average 44 months later, 15,786 attended a second health check. During 1996-2000 an assessment of social and psychological circumstances, based upon the Health and Life Experiences Questionnaire (HLEQ) was completed by 20,921 participants, representing a response rate of 73.2% of the total EPIC eligible sample. Of those participants, 18,248 attended the first and 13,112 attended the second health check, with leukocyte counts available for 12,818, respectively 13,241 participants.
Recruitment rate	73.2%
Geographic/ Socio-economic group	Residents in East Anglia, UK.
Date at start of study.	1993
FOLLOW UP	
Age at follow up	
Sample size at measure of outcome	13,112 participants
Length of follow up	44 months
Percentage followed up	

Bias/Other	1. Recall bias
EXPOSURE	
	1. Adverse childhood experiences (ACE). A self-completed questionnaire that included items usually found in the assessment of ACE before the age of 17 was administered during the interval between health checks. The questionnaire included items like separation from mothers for more than 1 year, parental divorce, being sent away from home because of doing something wrong, experience of physical abuse by someone close to them, etc.
Confounder/ Other	
	Confounders: 1. Age 2. Sex 3. Age-sex interaction 4. Calendar month of leukocyte assay Mediators: 1. Social circumstances (educational attainment and social class) 2. Lifestyle factors (smoking history, alcohol intake) 3. Psychosocial factors (hostility, lifetime depression, and experiences during adulthood of stressful events, expressed as a rate and not including events concerning illness or injury to self) 4. BMI 5. Triglycerides 6. Systolic blood pressure (SBP) 7. Adjusted FEV_1 (forced expiratory volume of gas in 1 second) 8. Plasma vitamin C
OUTCOME	
	1. White blood cell (WBC) counts. 2. Leukocyte (granulocyte, lymphocyte, and monocyte) counts.
STATISTIC ANALYSIS	
Analysis details	After exclusion of those with prevalent conditions at EPIC baseline (cancer, diabetes, heart attack, and stroke), the sample available for analysis included data from 15,059 participants, 11,367 with data from the first and 11,857 with data from the second health check. 1. Multiple linear regression models
RESULTS	
Result details	For the sample of 11,857 participants, 6,418 problems were reported (a rate of 0.54 per person), with 7,481 (63.1%) of the sample reporting none, 2,925 (24.7%) reporting 1, 1,451 (12.2%) more than 1 ACE. The most commonly reported problems were the experience of a frightening event (reported by 18% of the sample), and being separated from mother (13%). Abuse was reported by 4% of the sample and the least commonly reported experience was being sent away from home (0.5%). **A positive association was observed for lymphocyte counts at both health checks and for the total WBC at the first health check only. No associations were observed for granulocytes and monocytes.** Table 3 shows age-sex adjusted associations between ACE and lymphocyte counts and adjusted associations were observed at

	both health checks. **There was a 2.5% increase in lymphocyte counts for those who reported more than 2 ACE as compared with those reporting none (a difference of 0.05 * 10^3 /uL, p=0.003) at first health check and a 2.5% increase at the second health check (a difference of 0.05 * 10^3 /uL, p=0.005).** **Regarding Table 4, the magnitude of association was greatest for being sent away from home and for physical abuse. As the number of participants who reported being sent away was small, they concluded that a major component of the combined childhood-lymphocyte association is due to the contribution of physical abuse.** **Table 6 shows the relative effect size of the association between ACE and lymphocyte counts after successive adjustments. Considered separately, lifestyle factors accounted for 45% to 50% of the association at both health checks and psychosocial factors accounted for 20-40%. Considered together, lifestyle factors were most important, with psychosocial factors resulting in only a small additional reduction in effect size.**
Conclusion	The study shows a positive association between ACE and measures of immune status in adulthood, namely lymphocyte (responsible for acquired immunity) counts, nut not for total WBC, granulocytes and monocytes.
Data extractors observation	Limitations: 1. Recall bias. 2. Residual confounding. 3. Exposure and outcome data may not come from the same people.
Total quality criteria score	2

Authors/ Title/ Journal	**Wyman, P.A., Moynihan, J., Eberly, S., Cox, C., Cross, W., Jin, X., & Caserta, M. (2007). Association of family stress with Natural Killer cell activity and the frequency of illnesses in children. Archives of Pediatric and Adolescence Medicine.**
Their focus of the study	To examine prospective associations between chronic stress in the parent-child and family systems and subsequent rates of illnesses and the activity of natural killer (NK) cells in children.
COHORT DETAILS	
Source	
Age at recruitment	5-10 years old
Sample size at measure of exposure	169 children and their parents
Method of recruitment	Children (aged 5-10 years) were recruited from a population already participating in a study of childhood infections at the University of Rochester School of Medicine and Dentistry. Participants were initially identified by visits to the emergency department or other pediatric services of the Golisano Children's Hospital at Strong, Rochester. Only 1 child per family was enrolled, and all were healthy at enrollment.
Recruitment rate	
Geographic/ Socio-economic group	Participants included 169 children and their parents. The mean age was 7 years for children and 35 years (range, 21-73 years) for their parents; 158 (93.5%) of parents were female; and 151 (89.4%) were mothers of participants.
Date at start of study.	2001
FOLLOW UP	
Age at follow up	6.5-11.5 years old
Sample size at measure of outcome	At visit 2, 158 subjects remained, and 147 completed visit 4.
Length of follow up	18 months
Percentage followed up	At visit 2: 93.5% and visit 4: 87%
Bias/Other	
EXPOSURE	
	Parents completed the following measures of personal and family stress: 1. The 51-item Brief Symptom Inventory (BSI) was completed every 6 months to assess psychiatric symptoms, including depression and anxiety. 2. Parents used the Stressful Life Events and Conditions Checklist (SLECC) at study entry to indicate which of 35 adverse events (eg, violence exposure) and chronic processes (eg, parental unemployment) had occurred since the child's birth. At each

	subsequent visit, parents reported which events were ongoing or had newly occurred during the preceding 6-month interval and rated the severity of each event on a numerical scale. 3. The parental isolation and attachment problem subscales from the Parenting Stress Inventory (PSI) assessed parent-child relationship stress at enrollment and again 1 year later. 4. The Adult-Adolescent Parenting Inventory (AAPI) assessed attitudes associated with child maltreatment and was completed at visit 2 and again 1 year later. 5. An 8-item family conflict measure was completed at each visit. Higher scores on the BSI, SLECC, PSI, and family conflict measures indicate higher levels of stress, whereas higher scores on the AAPI indicated more competent parenting attitudes.
Confounder/ Other	
	Confounders: 1. Age 2. Sex 3. Race 4. Annual household income per person
OUTCOME	
	1. Rate of total illness 2. Rate of febrile illness 3. The NK cell cytotoxicity
STATISTIC ANALYSIS	
Analysis details	1.Poisson regression 2. Multiple linear regression
RESULTS	
Result details	The number of child illnesses reported by parents during the 365 days following visit 2 ranged from 0 to 10 (median, 2) (Table 2). The number of febrile illnesses reported during the year following visit 2 ranged from 0 to 6 (median, 0). During the follow-up, 56.2% of the children did not have a febrile illness, 37.3% had 1 or 2, and 7.1% had 3 or more. Of the 389 parental reports of illness, 281 were nonfebrile. The recorded temperatures for febrile illnesses ranged from 38.1℃ to 40.5℃ (mean, 38.8℃). Parents reported 37 (34.3%) of 108 illnesses as febrile, but did not provide a temperature reading. Although parents indicated that an additional 12 illnesses were febrile, the recorded temperatures were 38℃ or lower; these were recoded as nonfebrile illnesses for analysis. Eighty-nine percent of the families had complete diary data for more than 350 days during the year following visit 2. **For each 1-U increase in stress factor 1 (parent impaired by family stress), children had an increased rate of total illnesses of 11% (P =.05; rate ratio, 1.11; 95% CI, 1.00-1.22) and a 36% increased rate of febrile illnesses (P =.001; rate ratio, 1.36; 95% CI, 1.13-1.64) in the subsequent year (Table3).**

Table 3. Association of Study Factors and Variables With Outcomes of Illnesses and Febrile Illnesses*

Factor or Variable	Analysis With Factors (n = 150)				Analysis With Variables (n = 151)			
	All Illnesses		Febrile Illnesses		All Illnesses		Febrile Illnesses	
	RR (95% CI)	*P* Value	RR (95% CI)	*P* Value	RR (95% CI)	*P* Value	RR (95% CI)	*P* Value
Factor								
Parent impaired by family stress (factor 1)	1.11 (1.00-1.22)	.05	1.36 (1.13-1.64)	.001	…	…	…	…
Parenting role stress (factor 2)	1.08 (0.97-1.21)	.15	0.98 (0.81-1.21)	.88	…	…	…	…
Variable								
BSI	…	…	…	…	1.49 (1.12-1.97)	.01	1.60 (0.94-2.73)	.08
SLECC	…	…	…	…	1.00 (0.98-1.02)	.95	1.03 (1.00-1.06)	.08
AAPI	…	…	…	…	1.00 (1.00-1.01)	.37	1.00 (0.98-1.01)	.40
Family conflict	…	…	…	…	0.98 (0.95-1.02)	.31	0.98 (0.93-1.05)	.60

Abbreviations: AAPI, Adult-Adolescent Parenting Inventory; BSI, Brief Symptom Inventory; CI, confidence interval; RR, rate ratio; SLECC, Stressful Life Events and Conditions Checklist; ellipses, not applicable.

*Analyses were adjusted for child age, sex, and race and annual household income per person.

Analyses with individual stress variables showed that children with parents reporting more psychiatric symptoms (higher BSI scores) also had more illnesses overall (P=.01; rate ratio, 1.49; 95% CI, 1.12-1.97).

For each 1-U increase in factor 1 (parent impaired by family stress), the natural log of NK cell function at visit 4 increased by 0.15 (P=.004; 95% CI, 0.05-0.26). One individual variable was significantly associated with NK function at visit 4: more family psychosocial adversities (mean score on the SLECC from visits 2-4) were associated with increased NK cell function (P=.04; estimate, 0.02; 95% CI, 0.00-0.05).

Results were similar when the child's illness at visit 4 was included in the model.

Sex did not moderate any of these findings (Table 4).

Table 4. Adjusted Mean Differences in the Natural Log of NK Cell Function for Study Variables*

Factor or Variable	NK Cell Function			
	Analysis With Factors (n = 137)		Analysis With Variables (n = 137)	
	Estimate (95% CI)	*P* Value	Estimate (95% CI)	*P* Value
Factor				
Parent impaired by family stress (factor 1)	0.15 (0.05 to 0.26)	.004	…	…
Parenting role stress (factor 2)	-0.02 (-0.11 to 0.08)	.76	…	…
Variable				
BSI	…	…	0.28 (-0.09 to 0.65)	.13
SLECC at enrollment	…	…	-0.02 (-0.05 to 0.01)	.24
SLECC at visits 2-4	…	…	0.02 (0.00 to 0.05)	.04
AAPI	…	…	-0.00 (-0.01 to 0.01)	.94
Family conflict	…	…	-0.01 (-0.05 to 0.03)	.61
PSI	…	…	-0.00 (-0.03 to 0.02)	.72

Abbreviations: AAPI, Adult-Adolescent Parenting Inventory; BSI, Brief Symptom Inventory; CI, confidence interval; NK, natural killer; PSI, Parenting Stress Inventory; SLECC, Stressful Life Events and Conditions Checklist; ellipses, not applicable.

*Analyses were adjusted for child age, race, and sex and annual household income per person. For each factor and variable, the estimated difference is for a 1-U increase.

	In the longitudinal analysis of NK cell function with stress measures entered separately for each 6-month interval, neither stress factor was significantly associated with NK cell function. However, elevated parental BSI scores were associated with higher NK function (P=.01; estimate, 0.22; 95% CI, 0.07-0.38), and elevated family conflict was associated with lower NK function (P=.04; estimate, -0.01; 95% CI, -0.03 to 0.00). The Poisson regression analyses examining the associations between illnesses and chronic stress were repeated with the addition of the average of NK cell function before and during measurement of illnesses. The NK cell average functions from visits 1 and 2 and from visits 3 and 4 were not associated with illnesses and did not enhance estimates of total illnesses. The addition of NK function also did not reduce the association between stress and illnesses or febrile illnesses. When the Poisson regression analyses were repeated without the 2 stress factors, neither NK cell variable was associated with total illnesses or febrile illnesses.
Conclusion	Chronic family stress was associated with increased illnesses in children. Unlike older adults, children living with elevated chronic stress had enhanced rather than decreased NK cytotoxicity, suggesting chronic stress may have different effects on the developing immune system. Impaired parental functioning may be a mechanism linking family stress with adverse effects on children's health.
Data extractors observation	Limitations: 1. Children's illnesses were recorded by parents without physician or laboratory confirmation. In addition, despite the provision of a thermometer to all families at enrollment, not all parents recorded temperatures consistently. However, most parents did consistently document their child's temperature at the time of illness symptoms, and the fact that the number of recorded illnesses during a 1-year period in this group of children was generally low and in keeping with those in the published literature increases our confidence in the reliability of the reporting. Although it is possible that psychiatric distress in parents would increase inaccurate recording of illnesses in their children, we consider it unlikely that parental distress could affect the objective finding of fever. 2. We also note that our cohort had a large proportion of low-income families by recruitment initially through emergency department and other clinic visits, and it cannot be assumed that these findings apply to children in all life contexts. 3. Although our protocol for blood sampling was designed to minimize acute stress, we cannot exclude venipuncture as a complicating effect on NK cell function. Most studies of acute stressors demonstrate an increase in NK cell activity. Studies of acute stress typically consist of a laboratory task administered in 15- to 20- minute blocks with blood sampling immediately after completion. In our study, the children were familiar with the study team and protocol and the blood was obtained after quiet play and the use of anesthetic cream. Because of these differences in design, we believe our protocol minimized the effect of acute stress on the results.

Total quality criteria score	3

Appendix 2

Christchurch Health and Development

Study Variables

The Parental Bonding Instrument (PBI) (Parker, Tulping, & Brown, 1979)

The PBI is a 25-item self-report measure using a 4-point Likert response format, assessing the individual's perception of his or her parents during the first 16 years of life. One form is completed for each parent. The PBI measures perceived maternal and paternal 'Care' and 'Overprotection'. Care involves a dimension from parental affection, warmth and empathy (high scores) to parental coldness, indifference and rejection (low scores). Overprotection or control ranges from intrusiveness (high scores) through to the detached promotion of independence (low scores). Twelve of the items are Care items, which allows for a maximum score of 36 for the Care dimension, and 13 of the items are the Overprotection items, which allows for a maximum score of 39 for the Overprotection dimension.

The PBI has good psychometric properties and is insensitive to the effects of the respondent's mood.

The PBI scales are presented below.

MOTHER FORM

This questionnaire lists various attitudes and behaviours of parents. As you remember your MOTHER in your first 16 years would you place a tick in the most appropriate box next to each question.

	Very like	Moderately like	Moderately unlike	Very unlike
1. Spoke to me in a warm and friendly voice	☐	☐	☐	☐
2. Did not help me as much as I needed	☐	☐	☐	☐
3. Let me do those things I liked doing	☐	☐	☐	☐
4. Seemed emotionally cold to me	☐	☐	☐	☐
5. Appeared to understand my problems and worries	☐	☐	☐	☐
6. Was affectionate to me	☐	☐	☐	☐
7. Liked me to make my own decisions	☐	☐	☐	☐
8. Did not want me to grow up	☐	☐	☐	☐
9. Tried to control everything I did	☐	☐	☐	☐
10. Invaded my privacy	☐	☐	☐	☐
11. Enjoyed talking things over with me	☐	☐	☐	☐
12. Frequently smiled at me	☐	☐	☐	☐
13. Tended to baby me	☐	☐	☐	☐
14. Did not seem to understand what I needed or wanted	☐	☐	☐	☐
15. Let me decide things for myself	☐	☐	☐	☐
16. Made me feel I wasn't wanted	☐	☐	☐	☐
17. Could make me feel better when I was upset	☐	☐	☐	☐
18. Did not talk with me very much	☐	☐	☐	☐
19. Tried to make me feel dependent on her/him	☐	☐	☐	☐
20. Felt I could not look after myself unless she/he was around	☐	☐	☐	☐
21. Gave me as much freedom as I wanted	☐	☐	☐	☐
22. Let me go out as often as I wanted	☐	☐	☐	☐
23. Was overprotective of me	☐	☐	☐	☐
24. Did not praise me	☐	☐	☐	☐
25. Let me dress in any way I pleased	☐	☐	☐	☐

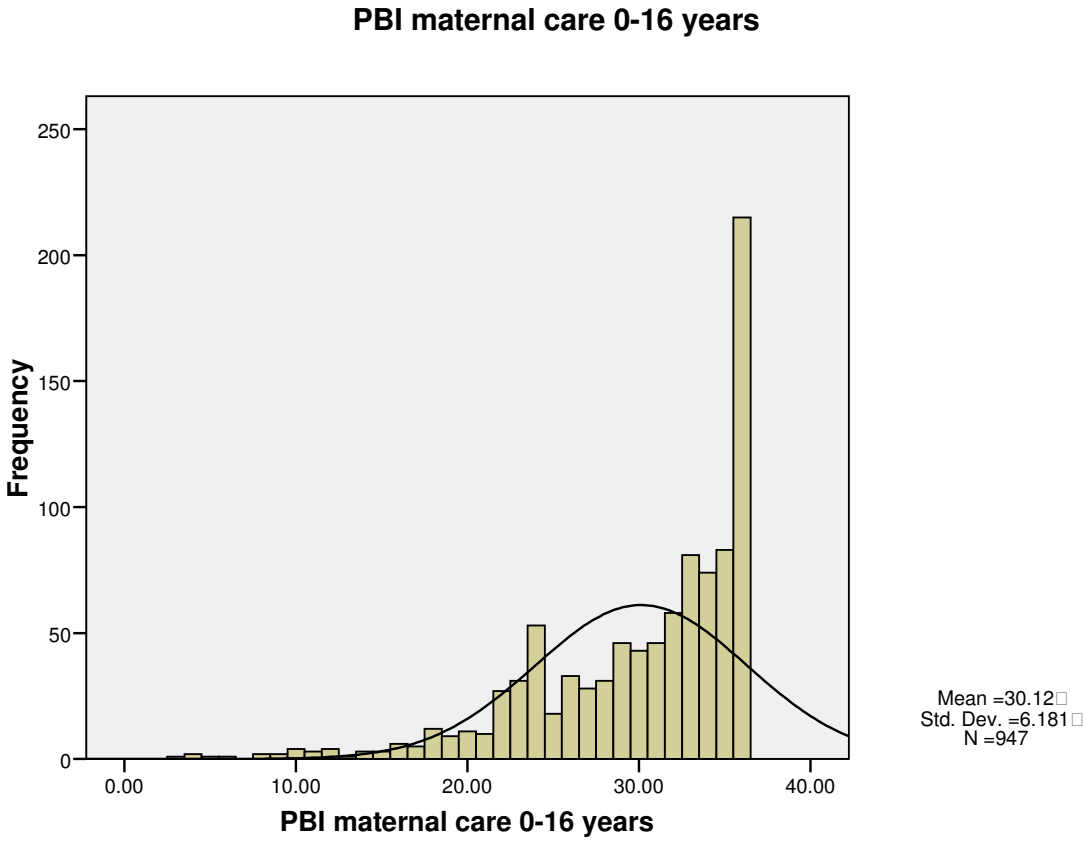
FATHER FORM

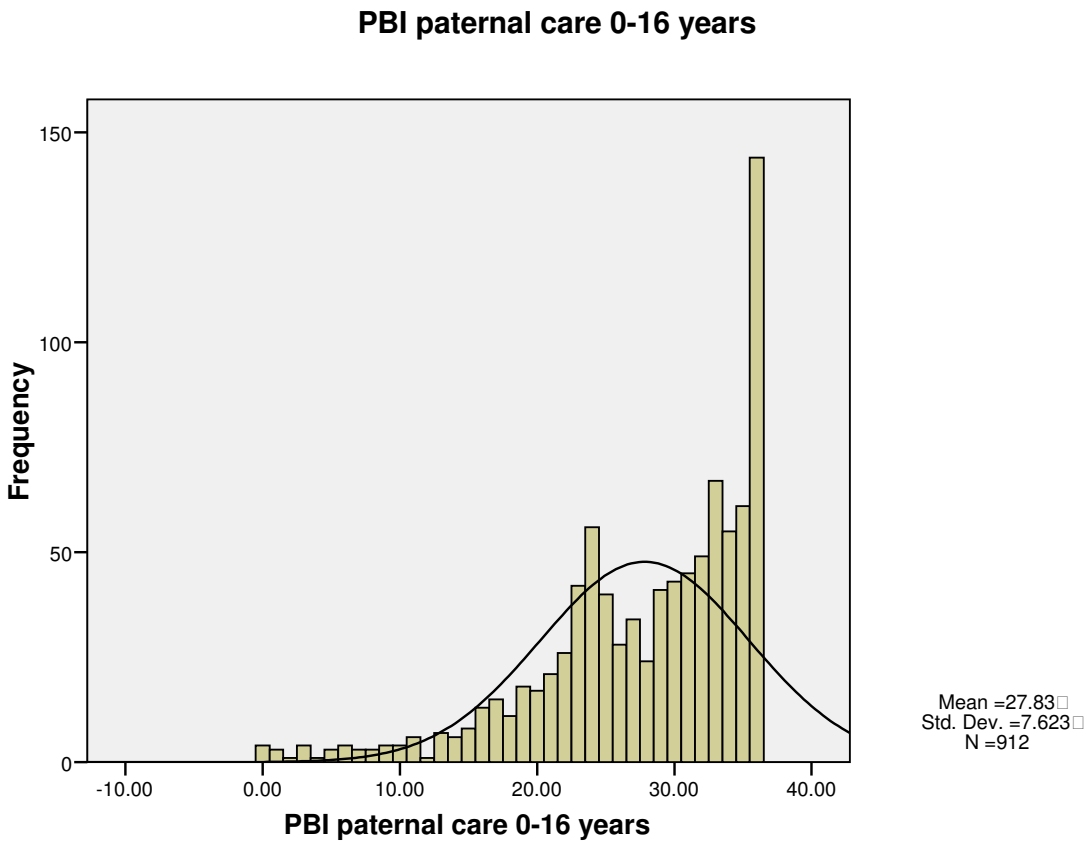
This questionnaire lists various attitudes and behaviours of parents. As you remember your FATHER in your first 16 years would you place a tick in the most appropriate box next to each question.

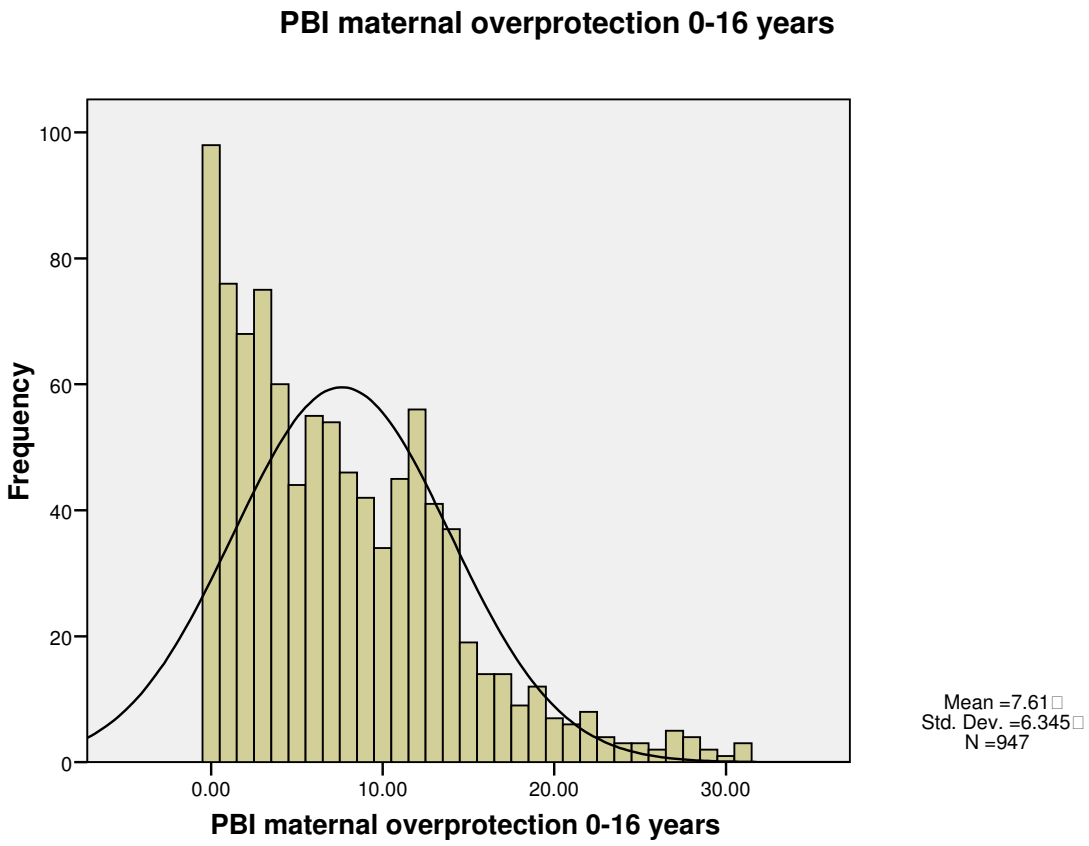
	Very like	Moderately like	Moderately unlike	Very unlike
1. Spoke to me in a warm and friendly voice	☐	☐	☐	☐
2. Did not help me as much as I needed	☐	☐	☐	☐
3. Let me do those things I liked doing	☐	☐	☐	☐
4. Seemed emotionally cold to me	☐	☐	☐	☐
5. Appeared to understand my problems and worries	☐	☐	☐	☐
6. Was affectionate to me	☐	☐	☐	☐
7. Liked me to make my own decisions	☐	☐	☐	☐
8. Did not want me to grow up	☐	☐	☐	☐
9. Tried to control everything I did	☐	☐	☐	☐
10. Invaded my privacy	☐	☐	☐	☐
11. Enjoyed talking things over with me	☐	☐	☐	☐
12. Frequently smiled at me	☐	☐	☐	☐
13. Tended to baby me	☐	☐	☐	☐
14. Did not seem to understand what I needed or wanted	☐	☐	☐	☐
15. Let me decide things for myself	☐	☐	☐	☐
16. Made me feel I wasn't wanted	☐	☐	☐	☐
17. Could make me feel better when I was upset	☐	☐	☐	☐
18. Did not talk with me very much	☐	☐	☐	☐
19. Tried to make me feel dependent of her/him	☐	☐	☐	☐
20. Felt I could not look after myself unless she/he was around	☐	☐	☐	☐
21. Gave me as much freedom as I wanted	☐	☐	☐	☐
22. Let me go out as often as I wanted	☐	☐	☐	☐
23. Was overprotective of me	☐	☐	☐	☐
24.Did not praise me	☐	☐	☐	☐
25. Let me dress in any way I pleased	☐	☐	☐	☐

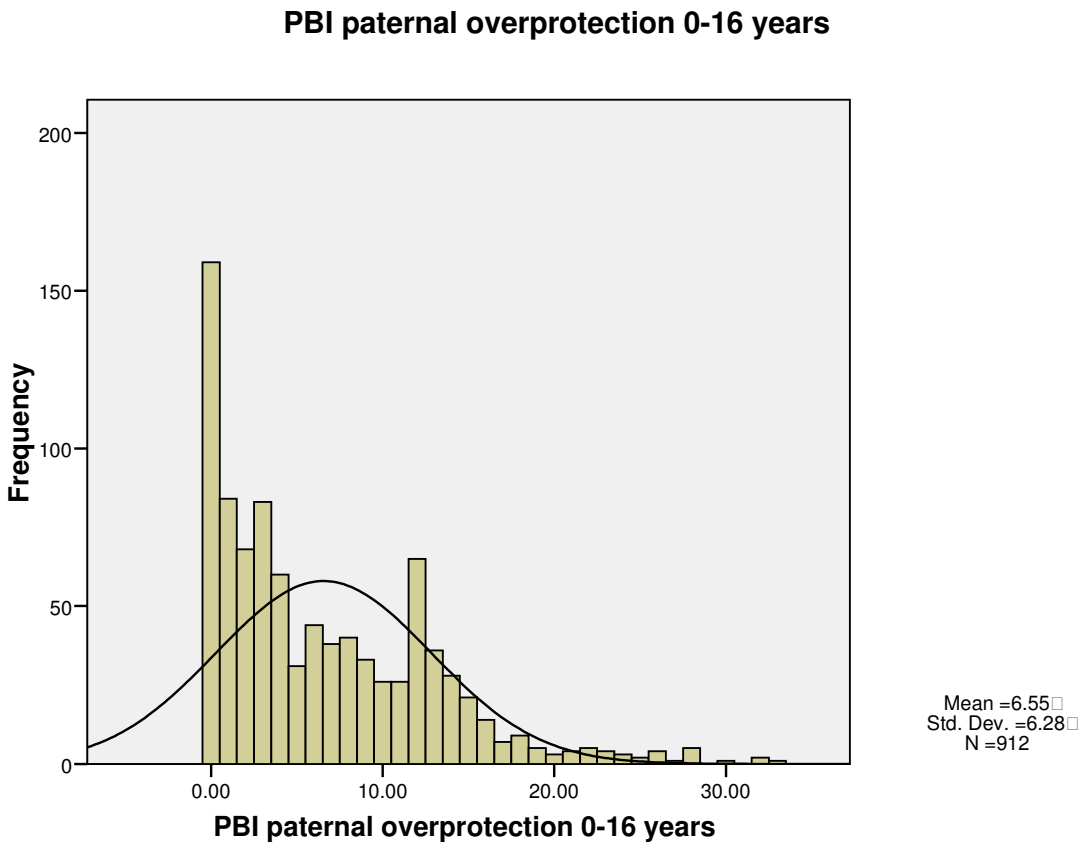
Care	
Items: 1, 5, 6, 11, 12, 17:	Very like = 3 Moderately like = 2 Moderately unlike = 1 Very unlike = 0
Items: 2, 4, 14, 16, 18, 24	Very unlike = 3 Moderately unlike = 2 Moderately like = 1 Very like = 0
Overprotection	
Items: 8, 9, 10, 13, 19, 20, 23	Very like = 3 Moderately like = 2 Moderately unlike = 1 Very unlike = 0
Items: 3, 7, 15, 21, 22, 25	Very unlike = 3 Moderately unlike = 2 Moderately like = 1 Very like = 0

Histograms


PBI maternal care 0-16 years
Frequency
250
200
150
100
50
0
0.00
10.00
20.00
30.00
40.00
PBI maternal care 0-16 years
Mean =30.12
Std. Dev. =6.181
N =947


PBI paternal care 0-16 years
Frequency
150
100
50
0
-10.00
0.00
10.00
20.00
30.00
40.00
PBI paternal care 0-16 years
Mean =27.83
Std. Dev. =7.623
N =912


PBI maternal overprotection 0-16 years
Frequency
100
80
60
40
20
0
0.00
10.00
20.00
30.00
PBI maternal overprotection 0-16 years
Mean =7.61
Std. Dev. =6.345
N =947


PBI paternal overprotection 0-16 years
Frequency
200
150
100
50
0
0.00
10.00
20.00
30.00
PBI paternal overprotection 0-16 years
Mean =6.55
Std. Dev. =6.28
N =912

The Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984)

HOME Inventory is designed to measure the quality and quantity of stimulation and support available to a child in the home environment. The initial version of the Inventory is called the Infant/Toddler HOME. It is designed for use during infancy (birth to age three). It is composed of 45 items clustered into six subscales:

1. Parental responsivity
2. Acceptance of child
3. Organization of the environment
4. Learning materials
5. Parental involvement
6. Variety in experience.

Two scales used in this thesis and derived from the initial version of the Infant/Toddler HOME Inventory are presented below.

HOME Inventory: Emotional and verbal response

1. Mother spontaneously vocalizes to child at least twice during visit.
2. Mother responds to child's vocalizations with verbal response.
3. Mother tells child the name of object or says name of person in 'a teaching style'.
4. Mother's speech is distinct, clear and audible.
5. Mother initiates verbal interchanges with observer-asks questions/ spontaneous comments.
6. Mother expresses ideas freely and easily and uses statements of

appropriate length of conversation.

7. Mother permits child occasionally to engage in ‘messy’ types of play.

8. Mother spontaneously praises the child’s qualities or behavior twice during visit.

9. When speaking of or to child, mother’s voice conveys positive feeling.

10. Mother caresses or kisses child at least once during visit.

11. Mother shows some positive emotional responses to praise of child offered by visitor.

HOME Inventory: Avoidance of restriction and punishment

1. Mother does not shout at child during visit.

2. Mother does not express overt annoyance with or hostility toward child.

3. Mother neither slaps nor spanks child during visit.

4. Mother reports no more than one instance of physical punishment, during the past week.

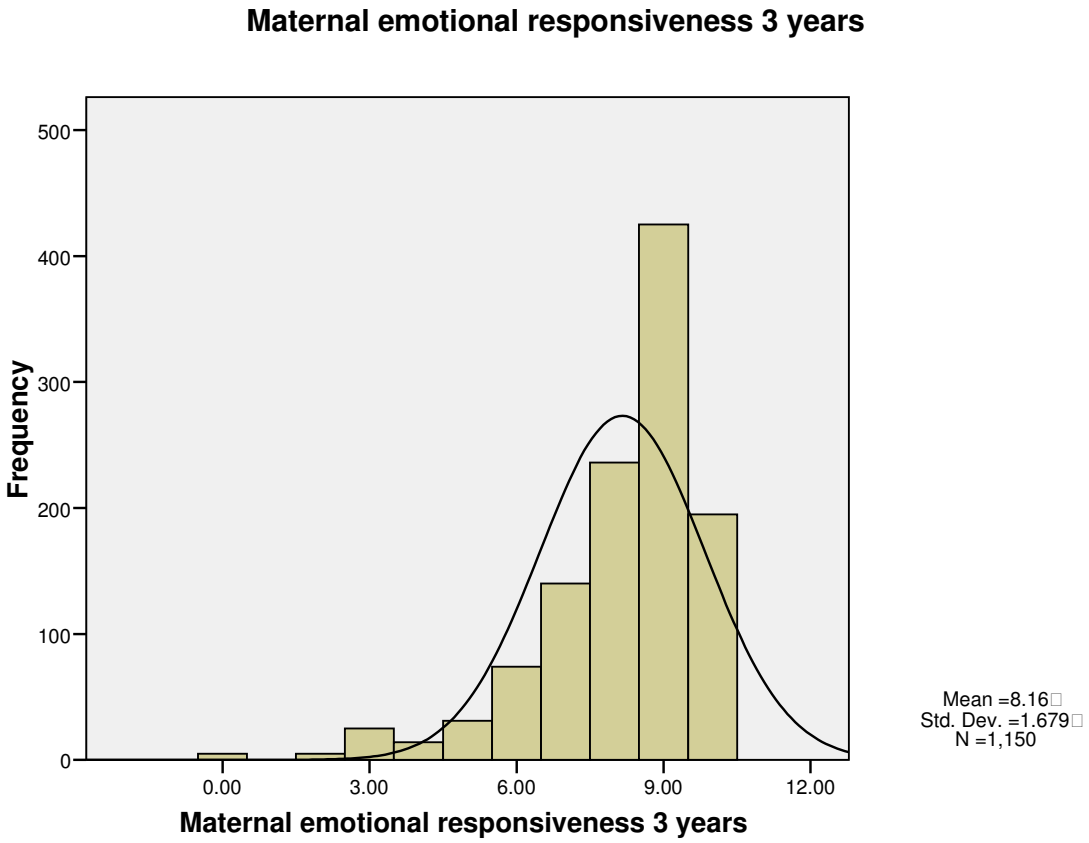
5. Mother does not scold or derogate child during visit.

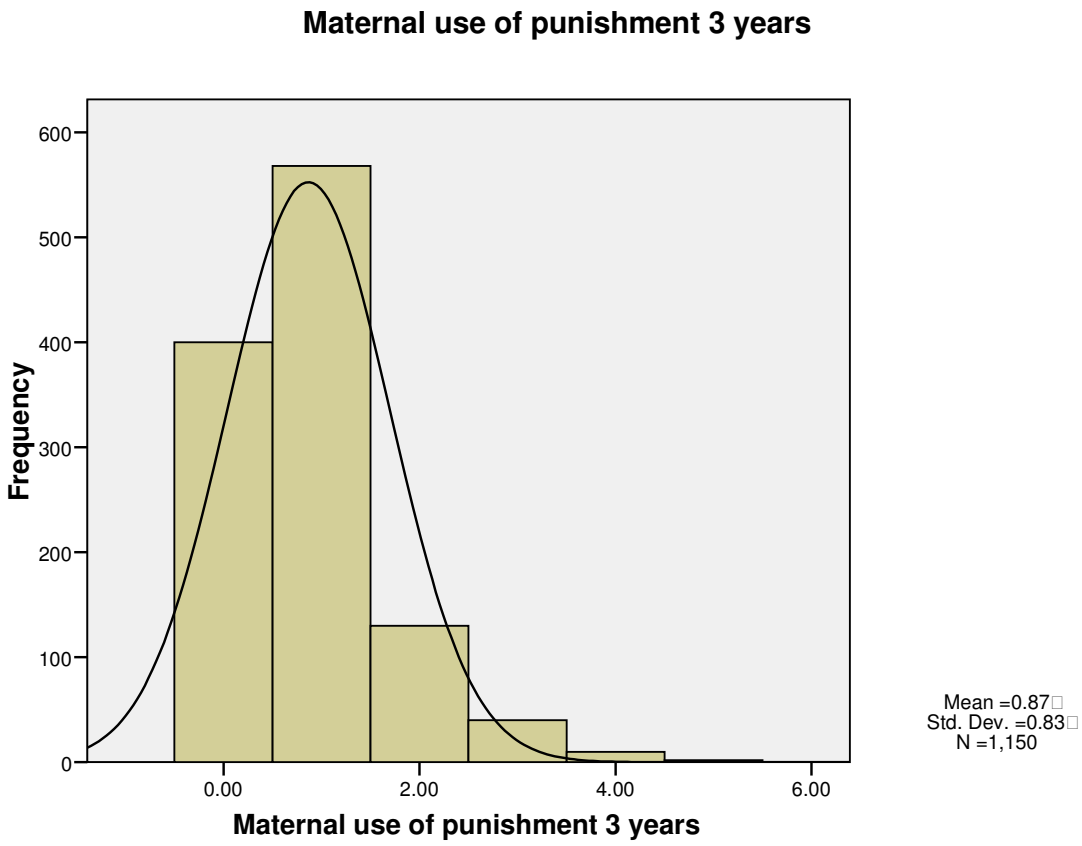
6. Mother does not interfere with child’s actions or restrict child’s movement more than three times during visit.

7. At least ten books are present and visible.

8. Family has a pet.

Histograms


Maternal emotional responsiveness 3 years
Frequency
500
400
300
200
100
0
0.00
3.00
6.00
9.00
12.00
Maternal emotional responsiveness 3 years
Mean =8.16
Std. Dev. =1.679
N =1,150


Maternal use of punishment 3 years
Frequency
600
500
400
300
200
100
0
0.00
2.00
4.00
6.00
Maternal use of punishment 3 years
Mean =0.87
Std. Dev. =0.83
N =1,150

The Armsden and Greenberg Scale of Parental and Peer Attachment (Armsden & Greenberg, 1987)

The Armsden and Greenberg Scale of Parental and Peer Attachment was developed in order to assess adolescents' perceptions of the positive and negative affective/cognitive dimension of relationships with parents and close friends. The theoretical framework is attachment theory. Three broad dimensions are assessed: degree of mutual trust, quality of communication, and extent of anger and alienation. The instrument is a self report questionnaire with a 5-point Likert scale response format. It consists of 25 items for the mother, 25 items for the father, and 25 items for the adolescent.

The scales are scored by reverse-scoring the negatively worded items and then summing the response values in each section.

The scales are presented below.

Relationship with mother

1. My mother respects my feelings.
2. I feel my mother does a good job as a mother.
3. I wish I had a different mother.
4. My mother accepts me as I am.
5. I like to get my mother’s point of view on things I am concerned about.
6. I feel it’s no use letting my feelings show around my mother.
7. My mother can tell when I am upset about something.
8. Talking over my problems with my mother makes me feel ashamed or foolish.

9. My mother expects too much of me.

10. I get upset easily around my mother.

11. I get upset a lot more than my mother knows about.

12. When we discuss things, my mother cares about my point of view.

13. My mother trusts my judgment.

14. My mother has her own problems, so I don't bother her with mine.

15. My mother helps me to understand myself better.

16. I tell my mother about my problems and troubles.

17. I feel angry with my mother.

18. I don't get much attention from my mother.

19. My mother helps me to talk about my difficulties.

20. My mother understands me.

21. When I am angry about something, my mother tries to be understanding.

22. I trust my mother.

23. My mother doesn't understand what I am going through these days.

24. I can count on my mother when I need to get something off my chest.

25. If my mother knows something is bothering me, she asks me about it.

Relationship with father

1. My father respects my feelings.

2. I feel my father does a good job as a mother.

3. I wish I had a different father.

4. My father accepts me as I am.

5. I like to get my father’s point of view on things I am concerned about.

6. I feel it’s no use letting my feelings show around my father.

7. My father can tell when I am upset about something.

8. Talking over my problems with my father makes me feel ashamed or foolish.

9. My father expects too much of me.

10. I get upset easily around my father.

11. I get upset a lot more than my father knows about.

12. When we discuss things, my father cares about my point of view.

13. My father trusts my judgment.

14. My father has her own problems, so I don't bother her with mine.

15. My father helps me to understand myself better.

16. I tell my father about my problems and troubles.

17. I feel angry with my father.

18. I don't get much attention from my father.

19. My father helps me to talk about my difficulties.

20. My father understands me.

21. When I am angry about something, my father tries to be understanding.

22. I trust my father.

23. My father doesn't understand what I am going through these days.

24. I can count on my father when I need to get something off my chest.

25. If my father knows something is bothering me, she asks me about it.

Relationship with friends

1. I like to get my friends' point of view on things I'm concerned about.

2. My friends can tell when I'm upset about something.

3. When we discuss things, my friends care about my point of view.

4. When I discuss things, my friends care about my point of view.

5. I wish I had different friends.

6. My friends understand me.

7. My friends help me to talk about my difficulties.

8. My friends accept me as I am.

9. I feel the need to be in touch with my friends more often.

10. My friends don't understand what I'm going through these days.

11. I feel alone or apart when I'm with my friends.

12. My friends listen to what I have to say.

13. I feel my friends are good friends.

14. My friends are fairly easy to talk to.

15. When I am angry about something, my friends try to be understanding.

16. My friends help me to understand myself better.

17. My friends care about how I am.

18. I feel angry with my friends.

19. I can count on my friends when I need to get something off my chest.

20. I trust my friends.

21. My friends respect my feelings.

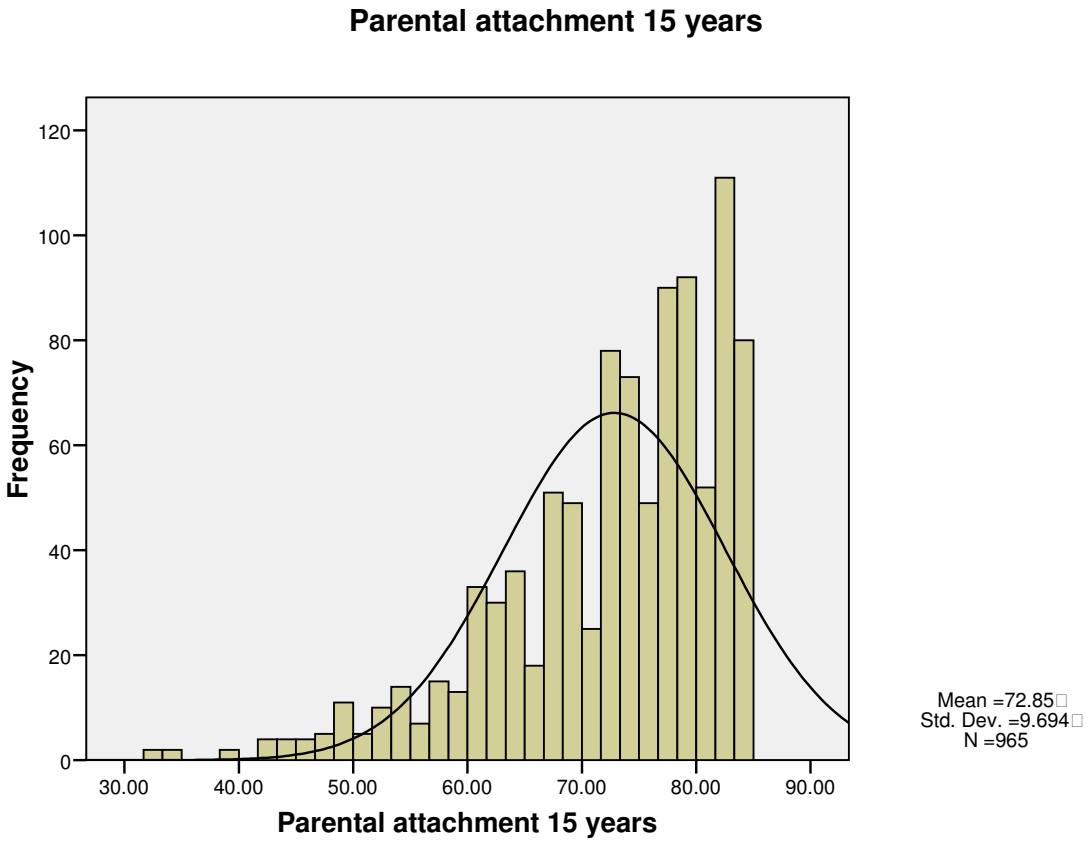
22. I get upset a lot more than my friends know about.

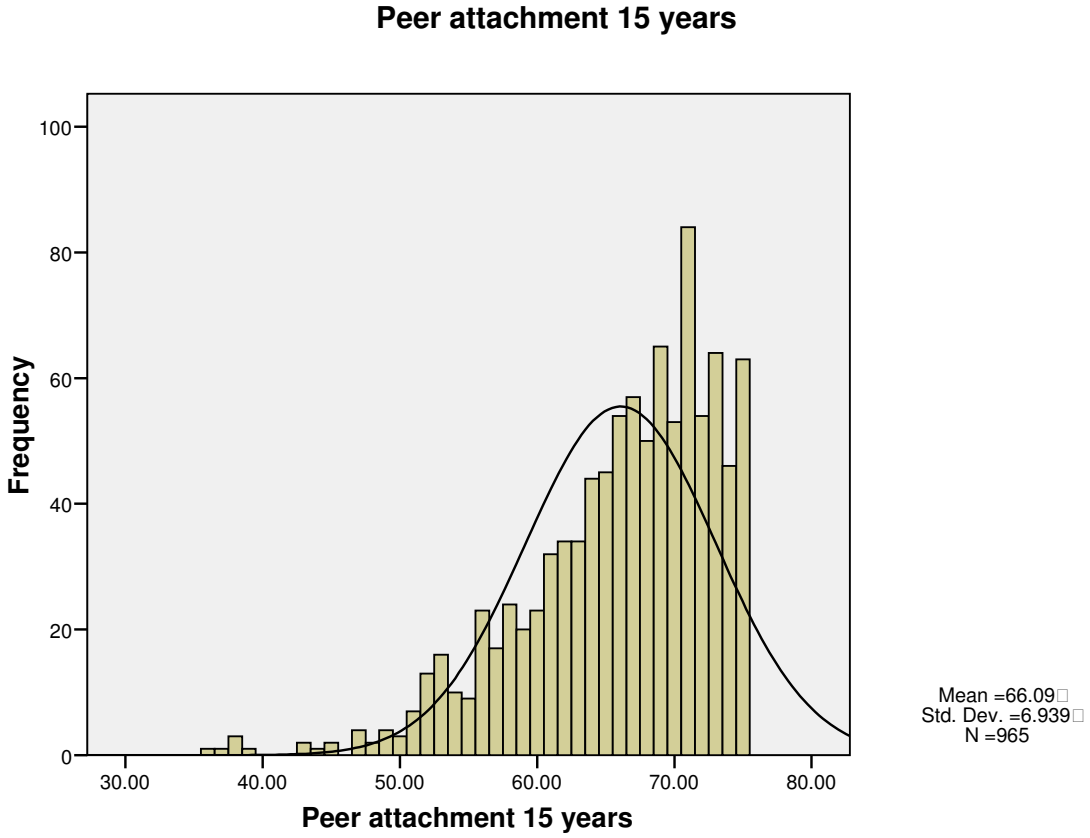
23. It seems as if my friends are irritated with me for no reason.

24. I can tell my friends about my problems and troubles.

25. If my friends know something is bothering me, they ask me about it.

Histograms


Parental attachment 15 years
Frequency
120
100
80
60
40
20
0
30.00
40.00
50.00
60.00
70.00
80.00
90.00
Parental attachment 15 years
Mean =72.85
Std. Dev. =9.694
N =965


Peer attachment 15 years
Frequency
100
80
60
40
20
0
30.00
40.00
50.00
60.00
70.00
80.00
Peer attachment 15 years
Mean =66.09
Std. Dev. =6.939
N =965

The Conflict Tactics Scale for Parent-Child Relationship (Straus, 1979)

The Conflict Tactics Scale has been widely used in measuring intra-family violence. This instrument has 19 items and it is considered to have moderate internal consistency and concurrent validity. The scale has been criticized for several reasons: it includes a limited set of violent acts; items that deal with threats are counted as violence; acts that differ greatly in severity are given equal value or weight; the context in which the violence occurs is ignored; and the perpetrator of the violence is often not specified.

The scale is presented below.

1. Explained why something was wrong.
2. Put him/her in 'time out' (or sent to his/her room).
3. Shook him/her.
4. Hit him/her on the bottom with something like a belt, hairbrush, a stick or some other hard object.
5. Gave him/her something else to do instead of what he/she was doing wrong.
6. Shouted, yelled, or screamed at him/her.
7. Hit him/her with a fist or kicked him/her hard.
8. Spanked him/her on the bottom with your bare hand.
9. Grabbed him/her around the neck and choked him/her.
10. Swore or cursed at him/her.
11. Beat him/her up, that is you hit him/her over and over as hard as you could.
12. Said you would send him/her away or kick him/her out of the house.
13. Burned or scalded him/her on purpose.

14. Threatened to spank or hit him/her but did not actually do it.

15. Hit him/her on some other part of the body besides the bottom with something like a belt, hairbrush, a stick or some other hard object.

16. Slapped him/her on the hand, arm, or leg.

17. Took away privileges or grounded him/her.

18. Pinched him/her.

19. Threatened him/her with a knife or gun.

20. Threw or knocked him/her down.

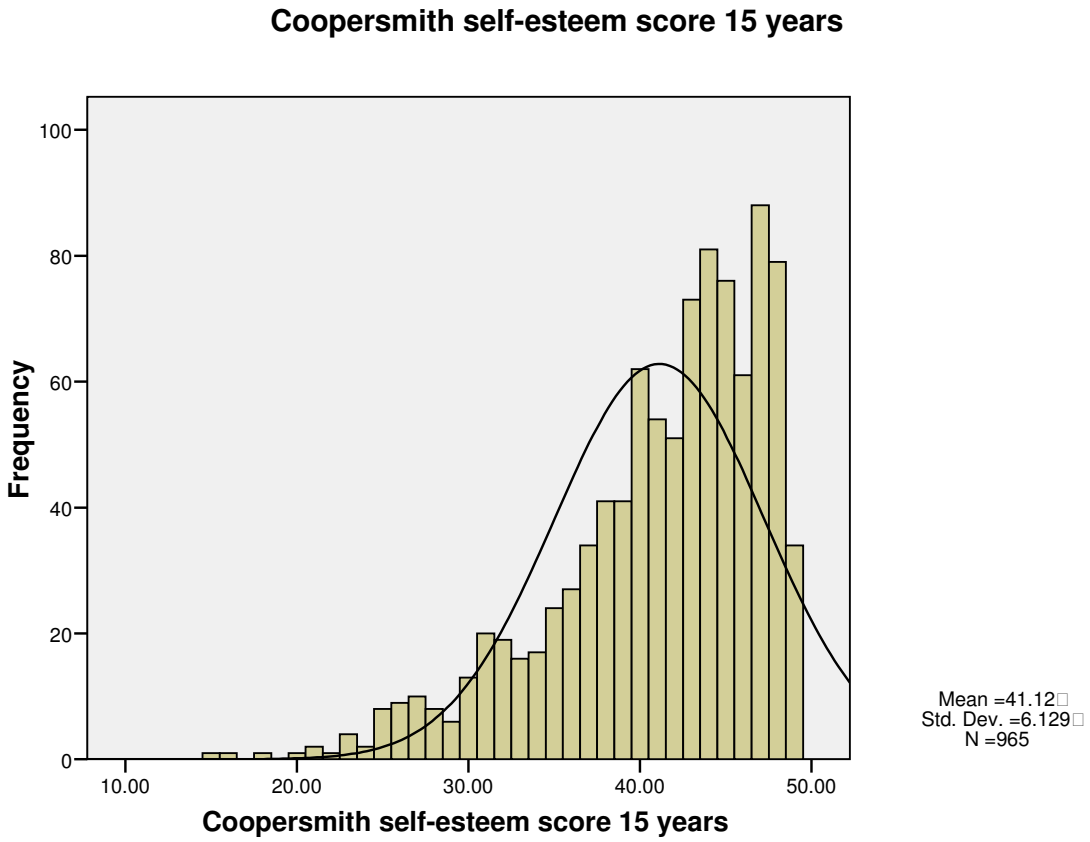
21. Called him/her dumb or lazy or some other name like that.

22. Slapped him/her on the face or head or ears.

The Coopersmith Self-Esteem Inventory (Coopersmith, 1981)

The Coopersmith Self-Esteem Inventory was developed to assess attitudes towards oneself in general, and in specific contexts: peers, parents, school, and personal interests. Respondents state whether a set of 50 generally favorable or unfavorable aspects of a person are 'like me' or 'not like me'. There are two forms, a School Form (ages 8-15) and an Adult form (ages 16 and older). Good reliability and validity information exists for the Self-Esteem Inventory.

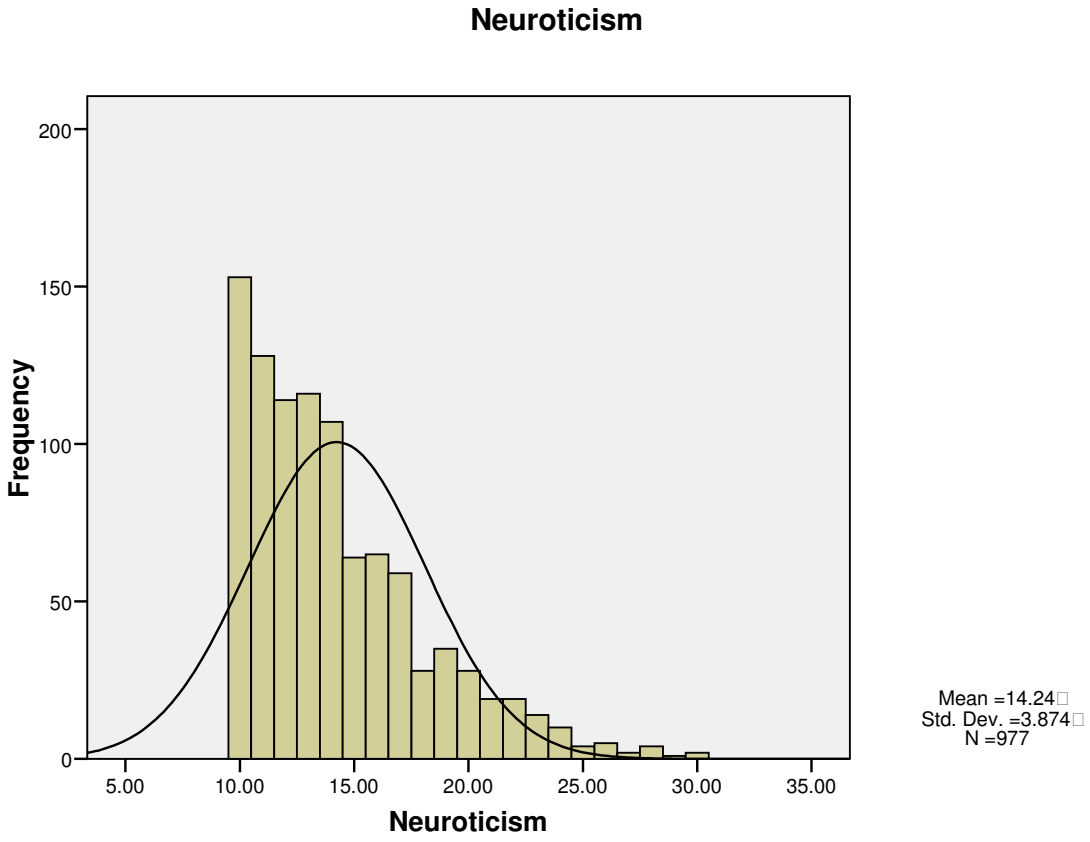
Histogram



The Eysenck Personality Inventory (Eysenck, 1964)

The Eysenck Personality Inventory is a self-report personality inventory based on Hans Eysenck's factor analysis of personality which assumes three basic factors (the two most important being extraversion to introversion and neuroticism).

Histogram



The Tridimensional Personality Inventory (Cloninger, 1987)

The tridimensional model of personality is based on neurogenetic adaptive mechanisms, with dimensions of novelty seeking, reward dependence, and harm avoidance.

Histogram